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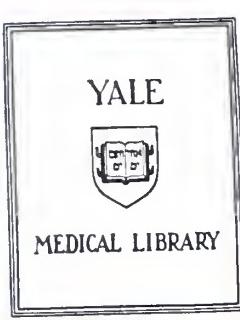
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AN EVALUATION OF A HOSPITAL-BASED PROGRAM  
FOR THE PREDICTION AND PREVENTION OF  
CHILD ABUSE AND NEGLECT

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Richard Bruce Garber

1985



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AN EVALUATION OF A HOSPITAL-BASED PROGRAM FOR THE PREDICTION  
AND PREVENTION OF CHILD ABUSE AND NEGLECT

A thesis submitted to the Yale University  
School of Medicine in partial fulfillment  
of the requirements for the degree of  
Doctor of Medicine

Richard Bruce Garber

1985



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## ABSTRACT

An observational cohort study was performed to examine the reasons why newborn infants were considered at risk for child maltreatment, to investigate whether these high risk infants did suffer maltreatment, and to determine the effectiveness of various interventions in preventing this outcome. Seventy nine infants identified as high risk by a hospital child abuse registry in the newborn period and 79 comparison infants matched for sex, race, birth date, and social class were followed over the first four or five years of life by reviewing their medical records and looking for evidence of poor outcomes. High risk infants had significantly more occurrences of physical abuse (7 vs. 1, P<.05), neglect (13 vs. 4, P<.05), placement outside the home (26 vs. 4, P<.001), and change of guardian (13 vs. 0, P<.001) than did comparison infants. These differences were present even after controlling for certain differences in baseline characteristics between the study groups. Forty eight percent of high risk infants suffered one of the above outcomes or sexual abuse, compared to only 11% of comparison infants (P<.001). The high risk infants also had more episodes of non-organic failure-to-thrive (6 vs. 1, P>.05) and suffered more serious injuries than did control infants. Major interventions offered to high risk families appeared to have an effect on reducing bad outcomes, but the numbers were insufficient to show statistical significance. No subgroup of high risk infants could be identified that suffered a worse outcome than the high risk group as a whole. The results of this study indicate that the child abuse registry is successfully identifying infants who are at high risk for the later occurrence of child abuse or neglect.



## INTRODUCTION

The incidence of child abuse in the United States is believed to be approximately 1% per year (Heins, 1984). Although this problem has recently received tremendous public attention, it has occupied the pediatric, psychiatric and social work literature since C. Henry Kempe's article "The Battered Child Syndrome" appeared in the Journal of the American Medical Association in 1962. The early literature was concerned with defining this syndrome, describing the victims and perpetrators, and establishing the diagnosis. Gradually, attention turned more towards how to treat both the battered children and their parents. Professionals active in this field now agree that such treatment programs are often ineffective in preventing the many irreversible sequelae of this syndrome, and that the best way of dealing with this syndrome is through efforts at prevention.

For prevention to be effective, accurate methods of identifying a high risk population are necessary so that money and efforts can be effectively targeted. Much of the recent literature on child abuse and neglect has dealt with efforts to determine which risk factors are predictive of the later occurrence of child maltreatment. Other studies have investigated the ability of particular screening procedures in the prenatal or neonatal period to accurately identify a high risk population. Although the results of many of these studies have produced confusing and often conflicting results, much progress has been made in the direction of identifying a high risk population. It is hoped that methods of prevention will soon become more effective at reducing the incidence of this syndrome.

In 1967, a program was developed at Yale-New Haven Hospital that was



aimed at the detection and registration of abused and neglected children (Rowe, 1970). A committee consisting of pediatricians, social workers, a child psychiatrist and a specialist in child development was established, and designated by the acronym DART for Detection, Assessment, Referral and Treatment. This committee investigates reports of child abuse and neglect, and maintains a registry of confirmed, suspected, and high risk cases. It was expected that this registry would aid in the detection of cases of abuse and neglect by making information on the child and his or her siblings more readily available.

The DART Committee has since its formation been identifying infants in the neonatal period considered to be at high risk for child abuse and entering them in its registry. The goal of this process has been to provide closer follow-up of these infants in an effort to intervene at the first sign of maltreatment, as well as to provide available preventive interventions to these infants and their families before any maltreatment occurs.

Infants are referred to the DART Committee by a social worker who is concerned that the infant is at high risk for the later occurrence of child maltreatment. The social worker first comes into contact with the infant and family either through the mother's involvement prenatally in the Women's Center, or because of referral from a clinician caring for the infant or mother during the perinatal period. After reviewing the medical records of the infant and the mother, as well as reviewing any contacts the family might have had with various social service agencies in the past, the social worker decides whether the child is at an increased risk for future child maltreatment. If so, she fills out a DART referral form which includes demographic data and the reason or reasons the infant is felt to be at high risk.



A previous, unpublished, medical student thesis examined this procedure and found it to be effective in identifying infants who were later abused or neglected (Ross-Asciutto, 1981). This study, however, used no control group, and it is therefore not clear whether the DART system is in fact effectively identifying high risk infants, or whether the entire hospital population is at high risk.

The purposes of this study are: (1) to examine the reasons why infants are referred to the DART Committee for presumed high risk for child maltreatment; (2) to investigate the ability of this system to predict which infants will in fact suffer maltreatment; and (3) to determine the effectiveness of various interventions in preventing this outcome. It is a matched observational cohort study in which the patients are followed over time by reviewing their medical records. The "exposure" in this study is the determination of high risk. The exposed group is a group of 79 patients referred to the DART Committee at birth because of presumed high risk for child maltreatment. The nonexposed group is a group of 79 patients born at Yale-New Haven Hospital and not referred to the committee, each of whom has been specifically matched with an exposed case for sex, mother's race, year of birth, and method of payment for the hospitalization. The latter two are intended to control for the time period studied and socio-economic status, respectively. All exposed and nonexposed infants were followed clinically at one of the two hospitals in the New Haven area or at one of two neighborhood health clinics, all of which provide similar health care to similar populations.

The literature review will review the history of what we now call child abuse, as well as the important studies and descriptions of treatments, risk factors, predictors, and efforts at prevention in the literature.



## REVIEW OF THE LITERATURE

### History

The first recorded case of child abuse in the United States was the celebrated case of an eight year old girl named Mary Ellen in 1874 (Heins, 1984). A church worker visiting an elderly lady in a tenement in New York learned that Mary Ellen was being starved and beaten by her foster parents. Appeals for help in removing the child from her home were made to the police and to the Department of Charities, but were unsuccessful. The church worker finally turned for help to the American Society for the Prevention of Cruelty to Animals, which had been founded in 1866. Arguing that as a member of the animal kingdom the child fell under the protection of laws preventing cruelty to animals, the society convinced the court to accept the case. Mary Ellen was removed from her home and placed in an orphanage, and her foster mother was found guilty of assault and battery and sentenced to prison for one year.

Mary Ellen's case was certainly not the beginning of child maltreatment. Recorded cases date back to ancient civilizations, and many consider the child labor system that existed in this country into the nineteenth century an antecedent of what we now call child abuse (Radbill, 1980). Mary Ellen's case, however, was well publicized, and the effects of this publicity were not long in coming. The American Society for the Prevention of Cruelty to Children was founded in 1875 as a result of this publicity, and the establishment of child welfare agencies followed.

Silverman (1972) attributes the writing of the first medical article on child abuse to Ambroise Tardieu in 1860 in Paris. Tardieu wrote about



the cases he encountered as medical examiner in Paris. In his 1860 paper, written in French, he described features of abused children and their abusers identical to those discussed today. The children were often young, and the perpetrators were most often their parents. He mentioned all of the commonly described injuries, including burns, bites, fractures, and "thickenings of blood on the surface of the brain" (Silverman, 1972, p. 350). He even discussed the commonly seen discrepancy between the history offered by the parents and the observed injuries.

Tardieu's article did not have much impact on the medical world. This may have been due to its publication in a French journal that was not widely read. Silverman believed it was because the article was written before the development of x-rays, and therefore the ability to easily diagnose and discover such cases was not yet available.

Future contributions to the study of the abuse of children awaited the development of the radiographic technique. It was John Caffey, the father of pediatric radiology, who made the next significant contribution to this field. Writing in 1946, he described six cases of young children who presented with radiologic evidence of subdural hematoma and multiple fractures of the long bones, each without any history of injury to explain these findings and without any evidence of generalized or localized skeletal disease which might predispose to pathologic fractures (Caffey, 1946).

In addition to the radiologic findings, some of Caffey's patients had poor weight gain, malnourishment, and retarded mental development, as well as such physical findings as scattered petechiae and ecchymoses, and retinal hemorrhages. Fractures were found in all of the long bones of the upper and lower extremities, but were not found in the small bones of the hands, feet, wrists, or ankles, and were not seen in the cranium or the



pelvic or shoulder girdles. In each patient, fractures of differing ages were found.

Prior to Caffey's writing, Ingraham and Matson (1944) had reviewed their experience with subdural hematoma in infancy at the Children's Hospital in Boston. They concluded that trauma was probably always a factor in its etiology, despite the fact that no history of trauma was available in almost half of their cases. They advised that the absence of such a history should never be considered definitive because a fall is "very apt to go unnoticed or be quickly forgotten by the parent or nursemaid" (p. 4).

Caffey agreed with this conclusion, as well as with the possibility that the responsible traumatic event might either go unnoticed or be forgotten. He did not feel, however, that a similar explanation was possible for the absence of a history of trauma to explain the fractured bones, because the clinical signs of a fracture usually appear immediately after the injury. "The injuries which caused the fractures in the long bones of these patients were either not observed or were denied when observed. The motive for denial has not been established" (Caffey, 1946, p. 172). Caffey even mentioned the possibility of intentional ill-treatment of one infant in his series who was clearly unwanted by both parents, but in his conclusion stated that the causal mechanism of these traumatic episodes remained obscure.

Barmeyer and his colleagues, writing in the Journal of Pediatrics in 1951, described a syndrome called "Traumatic Periostitis in Young Children" (Barmeyer, 1951). They described seven cases of young children with radiologic evidence of periostitis of the long bones of the lower extremities. History of trauma was adequate in some, inadequate to explain the injury in others, and absent in still others. One of the children had



been in a foster home under the supervision of the State Welfare Department. The authors made no mention of the possibility of inflicted injury, and concluded only that periostitis in young children was a result of trauma.

A similar syndrome, "Traumatic Ossifying Periostitis of the Newborn," had been described by Snedecor and others in 1935 (Snedecor, 1935). They described four cases of infants born by breech delivery, each of whom developed periostitis diagnosed radiologically during the first several weeks of life. In the absence of any other history of trauma, the authors concluded that the injuries had occurred during the delivery, and that this was a new type of birth injury.

It was Silverman, in 1953, who first stated in the English literature that parents or others might deliberately inflict injuries on children (Silverman, 1953). In his paper in the American Journal of Roentgenology, he reported three cases of children less than eight months of age who had radiologic evidence of skeletal trauma with no accompanying history. In each case the responsible pediatricians and orthopedists originally resisted the radiologic diagnosis, but on questioning the parents Silverman was able to obtain a history of trauma that had previously been specifically denied.

The parents in the first case gave a history of two previous episodes of accidental trauma, but Silverman "gained the impression that the mother was withholding some information" (p. 415). Case two was a seven month old who presented with a questionable history of an iron falling on her thigh and causing a burn. On examination she was noted to have dirty skin and a small ulcer on the genitalia. Radiologic examination revealed multiple old fractures of the long bones of three extremities. A history of numerous episodes of accidental trauma was then obtained from the parents. The



child died several months after discharge from the hospital, "supposedly of bronchopneumonia" (p. 420). Autopsy was not permitted. The third case was a two month old female who had clinical and then radiologic evidence of a fractured tibia with no history of trauma. On further questioning a history of accidental injury caused by the mother was obtained.

Silverman concluded from this study that individuals responsible for the care of children may "permit trauma and be unaware of it, may recognize trauma but forget or be reluctant to admit it or may deliberately injure the child and deny it" (p. 413). He also offered suggestions on how to obtain a history of trauma from parents who initially deny it.

In 1955, Woolley and Evans reviewed the common practice of searching for obscure causes to explain the presentation of children with radiologic evidence of skeletal lesions resembling those of traumatic origin but with no history of trauma (Woolley, 1955). They found no reason to continue to confuse traumatic injuries with those due to pathologic bone fragility. They also concluded that environmental factors surrounding infants with skeletal trauma ranged from unavoidable episodes in stable households through "unprotective environments," to the presence of "aggressive, immature or emotionally ill adults" (p. 542). They found that infants with multiple areas of bone damage invariably came from the latter environment, and had an incidence of injury to tissues other than the skeleton that was much greater than expected.

It was Dr. C. Henry Kempe who is generally credited with having brought the maltreatment of children to widespread recognition. As Chairman of the Program Committee of the Annual Meeting of the American Academy of Pediatrics in 1961, he organized a plenary session on the "Battered Child Syndrome." In 1962, an article written by him and his



colleagues with the same title appeared in the Journal of the American Medical Association (Kempe, 1962).

Kempe had been studying this problem for ten years, but had been unable to generate the attention he had desired (Kempe, 1971). He took advantage of his position on the Program Committee in 1961 to plan a session that he knew would be well attended. In addition, he chose the title of the session because he thought it would help get the attention of the membership (Heins, 1984). Publication of the subsequent article in the widely circulated JAMA was also essential to the widespread recognition Kempe was able to generate.

In the article, Kempe described the Battered Child Syndrome as "a clinical condition in young children who have received serious physical abuse, generally from a parent or foster parent," and stated that it was a "significant cause of childhood disability and death" (Kempe, 1962, p. 17). He went on to describe much of what is now commonly accepted as part of this syndrome. He said that the syndrome occurred in children of all ages, but most often in children under three years of age. The children often manifested sub-par general health, evidence of neglect including poor hygiene and malnutrition, multiple soft tissue injuries, multiple fractures in different stages of healing, and subdural hematomas. He also described a discrepancy between clinical findings and historical information as a major aspect of the syndrome.

Kempe also described much of what we still believe about the parents of these children. Frank psychosis was usually apparent in the parents of those children who were directly murdered. Other parents were found to be mentally retarded, psychopathic or sociopathic, or immature, impulsive, aggressive, and self-centered. Alcoholism, unstable marriages, criminal activities, and sexual promiscuity were also said to be common among these



parents. Importantly, Kempe noted that this syndrome was also found among families with good educations and stable financial and social backgrounds.

The article also noted that physicians have a difficult time dealing with this syndrome because they have difficulty believing that parents could intentionally harm their children, and also because they do not relish the tasks of questioning the parents and then reporting the incident to authorities. Kempe gave some advice on how best to obtain information from denying parents, and how to intervene effectively on behalf of the battered child. The major goal of such intervention, according to Kempe, was to make certain that a similar event would not happen again. He mentioned temporary placement with relatives or in a foster home as the major means of such protection.

The results of the new attention Dr. Kempe brought to the problem of child maltreatment came quickly. In 1963, the Children's Bureau of the Department of Health, Education and Welfare proposed model legislation requiring doctors and hospitals to report to the police children whom they had "reasonable grounds" to suspect had suffered inflicted injuries (Reinhart, 1964). Within five years, all 50 states had passed statutes based on this model legislation and intended to protect the child rather than punish the perpetrators (Heins, 1984).

In 1972, the C. Henry Kempe National Center for the Prevention and Treatment of Child Abuse and Neglect was established in Denver. The center is a resource and training center for professionals working in the field. In 1974, the Federal Child Abuse Prevention and Treatment Act established a national center in Washington, D.C. to coordinate research, demonstration projects and other activities in the field of child abuse. That same year, The Los Angeles Police Department established the nation's first battered child unit, which was to handle cases involving physical



and sexual abuse of children. In 1976, the International Society for the Prevention of Child Abuse and Neglect was established, and Dr. Kempe became its president, as well as editor-in-chief of its journal, Child Abuse and Neglect.

#### Current Aspects

Since the publication of Kempe's landmark article in 1962, the scope of the Battered Child Syndrome has broadened considerably. In 1963, Fontana proposed a different term, the "Maltreatment Syndrome," to emphasize this broader perspective (Fontana, 1963). He believed that the physically battered child was only the most serious aspect of the maltreatment spectrum, which also included physical, emotional, nutritional, and medical neglect. He also stated that children manifesting one of these milder forms of maltreatment might later suffer more serious manifestations, including death, if they were not protected.

It was again Kempe who in the late 1970's brought sexual abuse into the spectrum of the maltreatment syndrome. In a 1977 lecture, he defined sexual abuse as "the involvement of dependent, developmentally immature children and adolescents in sexual activities that they do not fully comprehend, to which they are unable to give informed consent, or that violate the social taboos of family roles" (Kempe, 1978b, p. 382). He believed at that time that the nationwide incidence of sexual abuse was at least 50,000 cases each year.

The abuse and neglect of children has become a major pediatric problem. It is estimated that 4,000 children die each year in the United States as a result of child abuse and neglect and that one million children in this country are maltreated by their parents annually.



(Fontana, 1984). It is clear that a great deal more needs to be done to protect the many victims of this syndrome. Much has been written about efforts at treatment, prediction, and prevention, and the important contributions to this literature will be reviewed after a brief summary of the currently accepted aspects of the child maltreatment syndrome.

The injuries seen in this syndrome cover a very wide spectrum. Death, permanent neurologic damage, skull fracture, rib fractures, extremity fractures and abdominal trauma are the most severe injuries seen. Less severe and sometimes unrecognized manifestations include malnutrition, poor hygiene, poor medical care including deficient immunizations and dental care, and evidence of emotional neglect. Lacerations, bruises or other injuries to the genital area are often the result of sexual abuse. The "non-organic failure-to-thrive" syndrome includes children with delayed growth and neurologic and psychological development who have no organic illness and who show marked improvement when separated from their parents (Taylor, 1979).

The diagnosis of maltreatment is often difficult. Parents will often withhold information about the cause of injury, and will often present a very real picture of concern about the child's well-being. The key to diagnosis is the suspicion of maltreatment when any of the aforementioned injuries are observed. Occasionally, pathognomonic signs such as hand-shaped bruises or belt-buckle marks are apparent on examination (Schmitt, 1980). Characteristic sites of injury, such as burns of the feet or buttocks, may also be noted (Feldman, 1980). The clinician must be alert to discrepancies between the history given by the parent and the injuries observed. Parents will often offer an explanation for the injury that is inconsistent with common sense or medical judgment. They may describe a minor accident when major trauma has obviously occurred, or



they may describe behavior that is impossible for the child's level of development, such as a ten month old allegedly climbing into a tub and turning on the hot water (Schmitt, 1980).

Radiography has become a major aid in the diagnosis of child abuse. Major radiologic manifestations include subperiosteal hemorrhage and calcification, metaphyseal fragmentation, and epiphyseal separation (Silverman, 1972). Skeletal injuries are often found in several different locations, and frequently are in different stages of healing. This indicates repeated episodes of trauma to different parts of the body. All children suspected of having suffered child maltreatment should receive a radiologic examination of the entire skeleton to look for such evidence of skeletal trauma.

The victims of child maltreatment are most often young children. Kempe's original article stated that most children are under 3 years of age (Kempe, 1962), but the average age of victims has been steadily increasing (Fontana, 1984). Maltreatment occurs in families of all races, socioeconomic statuses and religions, but differences in reporting often confuse this fact (Newberger, 1983). Steele (1980) concluded that for an episode of maltreatment to occur, certain characteristics of the child and parent must be present, as well as a stressful event or situation. More will be said about each of these in the discussion that follows.

The sequelae of this syndrome can be extremely severe. Death has occurred from neglect as well as from physical abuse (Adelson, 1963). Recent studies have demonstrated that victims of abuse and of neglect later manifest significant problems with language development, intellectual function, self-concept, and interpersonal relationships (Oates, 1984). These findings are particularly significant in view of the long accepted belief that victims of child maltreatment often become



violent juvenile delinquents and criminals (Fischler, 1984). Additionally, it is now widely accepted that children that have been abused themselves often grow up to abuse their children, causing an endless cycle of abuse within certain families (Steele, 1980).

Having briefly reviewed the many serious injuries seen in this syndrome, as well as the many irreversible sequelae, we can now examine some of the studies of the treatment, prediction, and prevention of this syndrome with a better understanding of their importance.

### Treatment

Over the past two decades clinicians dealing with abusive families have come to realize that child maltreatment is a result of a deficit in parenting and other interpersonal skills (Rosenfeld, 1977). This realization has fostered a change in emphasis from punitive measures directed at the perpetrators to efforts to help correct these deficits and improve the ability of these parents to adequately care for their children. The first goal of intervention, however, must be to insure the immediate safety of the child (Fontana, 1976).

Kempe (1971) stated his belief that the first action upon suspecting the occurrence of abuse must be immediate hospitalization of the child, both for diagnosis and for the child's protection. Most workers would now disagree with the need to hospitalize all victims, but would agree with the importance of acting early to protect the child. Many investigators have observed the tendency for maltreatment episodes to become more severe with time, and have emphasized the need for early intervention to prevent this progression (Fontana, 1963; Touloukian, 1968; Alfaro, 1984).

Rosenfeld and Newberger (1977) commented on the inherent conflict



between compassion and control in the treatment of child abuse and neglect. On one side of this conflict is the desire to understand the shortcomings of abusive parents and to help remedy these problems. This is the position often taken by social service agencies. The opposing side of the conflict is the frequent need to limit and sometimes punish deviant behavior. The authors concluded that different situations would necessitate the use of different mixes of these two types of interventions, and that often the threat of control could be used to make possible a compassionate intervention. They believed that cases in which chronic injury, lack of concern about the injury, social deviance of the parent, a child seen as intrinsically bad by the parent, poor parental impulse control, or a fused perception of parent and child existed would require greater use of control efforts and less emphasis on compassion.

Markham (1980) reviewed a different conflict in current efforts at child abuse intervention. She described one model supporting the thesis that the family's right to privacy is supreme and that interventions should only be forced on the family if "the child is suffering from a specifically identifiable risk of physical harm causing disfigurement, impairment of bodily functioning, or other serious injury" (p. 182). The opposing model is that of early and aggressive intervention in all cases of maltreatment, and its major priority is the protection of the child. In her review of the conflicting models, Markham concluded that the frequency with which unprotected children were reinjured made the intervention model necessary to both protect the victims and help the families.

Solnit (1980) disagreed with Markham's conclusion. He felt that "intrusions into the privacy of the family...should be minimized, and interventions that breach it should only be permitted on specific grounds, i.e., physical or sexual abuse and abandonment" (p. 170). He also stated



that earlier offers of voluntary assistance would be accepted by many families, and would diminish the need for coercive interventions.

It is in the context of these conflicts that difficult decisions about interventions in cases of child maltreatment must be made. Many centers have developed multidisciplinary teams composed of physicians, social workers, developmentalists, psychiatrists, attorneys and other social service personnel to evaluate cases of child abuse and to decide on appropriate management (Krugman, 1984; Schmitt, 1979; Kerns, 1979). These teams increase the types of expertise brought to the evaluation of each case and help to insure that all viewpoints are considered. They are also a means of providing support to those individuals who must make the difficult decisions that are often required in these cases. The DART Committee at Yale-New Haven Hospital is an example of such a multidisciplinary team (Rowe, 1967).

The most important decision that must be made by these teams and by all those involved with managing cases of child maltreatment is whether to place the child in foster care. The purpose of foster care is to provide a safe environment for the child while the parents are being helped to become better caretakers (Scheurer, 1980). The decision is an important one because the results of an improper decision can be very grave. Serious reabuse and even death might occur in a child who is not placed, and the child unnecessarily placed may suffer unnecessary psychological trauma.

Much has been written about the advantages and disadvantages of foster placement, and about how it should be used most effectively. The advantages are that the child can be provided with a safe environment in which he or she can grow both physically and emotionally, and the parents can be relieved of the stresses and responsibilities of caring for the child while they undergo therapy. The disadvantages are the psychologic



trauma that can result from the separation and the reattachment, the tensions that frequently develop between natural and foster parents, the fact that abuse and neglect might continue to occur in the foster home, and the frequent lack of a long-term plan for the child placed in foster care (Scheurer, 1980).

Scheurer and Bailey (1980) reviewed the decisions for foster placement made by their community-based child protection team over a two year period, and found five factors that explained all of the seventy one placements. These were deserted child, seriously physically abused child, seriously emotionally disturbed parents, parents refusing or unable to guarantee the safety of the child, and family with serious problems that recur or do not respond to treatment. The authors suggested that these five factors be used by other child protection agencies to decide on whether foster placement is warranted. These factors are essentially the same as those outlined by Schmitt (1979).

Because the major goal of foster placement is the protection of the child, the decision on when to return the child to the natural home is also very important. Schmitt outlined the following guidelines that must be met before the child can be returned home:(1) If either parent was diagnosed as being severely disturbed, that person must be improved or permanently out of the home;(2) The parents must be cooperative in therapy;(3) The parents must show evidence of improved ability to manage and cope with their child, and;(4) Crisis management must be improved.

Not all abusive families are treatable, and some children will never be returned to their homes. In order to facilitate permanent plans for the child, including adoption, it is necessary to pursue termination of parental rights when it is apparent that the child will not return home. Schmitt suggested a period of one year in foster placement before this



option is pursued. Scheurer and Bailey suggested a period of two years.

Most workers agree that foster placement is an option that should be used only when the child is at risk (Ory, 1981). In addition, placement should always be accompanied by other types of treatment (Scheurer, 1980). Many other types of treatment are offered to child abusing families, and the mix of interventions offered to each family is based on the particular needs of that family.

Traditional psychotherapy and counseling, including individual, marital, family, and group sessions, are offered when appropriate. Parents and children should receive initial psychiatric evaluations to determine which, if any, are indicated. Lay therapy is a different type of therapy involving trained nonprofessionals who visit the home once or twice a week and serve as parenting models, advisors in household management, and sources of support in times of crisis (Kerns, 1979). These therapists are often called Parent-Aides.

Parent education is an important aspect of many treatment programs. Based on the assumption that abusive parents lack knowledge about child development and parenting skills, these programs attempt to provide parents with a better understanding of these areas (Wolfe, 1984). Such programs are sometimes offered by social service agencies and public high schools. Robison (1979) studied the interactions of abusive parents and their children, and found these parents to be more "out of tune" with their child's behavior and desires than a group of similar parents who had not abused their children. She described a program at the New York Foundling Hospital designed to improve these inadequacies.

Day care and crisis nurseries are also offered to many parents as part of their treatment program. Day care centers provide a means for the mother to diminish her responsibilities and stresses so that she can take



better advantage of the other services being offered and begin to bring order back to her life. Crisis nurseries offer parents the opportunity to leave their child at the nursery immediately during times of increased stress, thereby serving as both a "rescue" for the child and a "bail out" for the parent (Wolfe, 1984).

Visiting nurses and home-makers are another aspect of many treatment plans. Nurses can help educate the parents in such key areas as nutrition, child development, hygiene, discipline, preventive health and medical compliance (Kerns, 1979). Home-makers assist with routine tasks at home, and can help educate the parent as well as free the mother to spend more time with her children.

Parents Anonymous is a nationwide network of voluntary self-help parents groups. It provides parents with a safe and supportive forum to discuss their problems, and allows them to develop more appropriate expectations of their children's development and behavior. It is also an effective means of helping the parents to improve their communication and socialization skills (MacFarlane, 1981).

Many social service agencies provide 24 hour hotlines to help in emergency crisis management, and many social service workers help their clients to take advantage of financial assistance programs available in the community. Drug and alcohol treatment programs also are an important aspect of the treatment plan for many families.

Treatment programs aimed at the victims of child maltreatment are less common than those directed at their parents, and have received far less attention in the literature. The goal of treatment is usually to prevent additional episodes of maltreatment, and not to heal wounds already suffered. Psychotherapy is offered to those children who need it, as discussed previously. Early childhood programs include therapeutic day



care and preschool, which provide the child with time and experiences away from a stressful home, and some missing stimulation (Alfaro, 1984). Special education programs are available for older children, and provide specialized training as well as counseling and emotional support.

Wodarski (1981) suggested that many treatment programs were ineffective because they focused on only one of the factors operating to "produce child abuse, i.e., lack of child management skills, marital dissatisfaction, or vocational or interpersonal skills dissatisfaction" (p. 353). He presented a comprehensive treatment program that included specific programs aimed at each of these four factors.

Straker and Jacobson (1979) also stressed the need for a multi-faceted treatment program, but they believed that the first step in planning such a program was the determination of which causal factors were active in a particular case. They presented a quantification system for determining which factors were active and therefore needed attention in a treatment program. Their quantification system was based on numerical scores for different factors, and the information was obtained from a clinical interview, psychiatric history, family interview, home visit, and psychometric assessment.

Fontana and Robison (1976) described a system of residential therapy for the mother and her child at the New York Foundling Hospital. The main goal of this program was to help the mother while preventing the separation of mother and child. Through the use of interviews and observations early in the hospitalization, individual treatment plans were formulated. Treatment included a lay therapist, a home-making therapist, and mother-child sessions in the nursery with a psychologist. Role-modeling was the major element of the program. In-patient treatment lasted three or four months, after which families were followed bi-weekly



by social service assistants. Forty four out of 56 responding mothers indicated that they were considerably helped by the program. Instructions in child care and learning patience and self-control were most frequently cited as the most helpful aspects of the program.

DePanfilis (1982) reported the results of a voluntary self-referral treatment program for abusive and neglectful parents in Erie County, Pennsylvania. The program was instituted in the belief that most abusive parents want to be helped and that treatment prognosis could be improved through early intervention. The program offered services similar to those described earlier in this discussion. Among 156 children and their families involved in the program over eighteen months, there was only one known incident of abuse/neglect. The author concluded that the program's success was due to the absence of hostility and resistance often seen among parents reported for child abuse. Other studies have also shown that self-referred parents benefitted more from treatment programs (Green, 1981).

Several studies evaluating treatment programs have appeared recently in the literature. The largest was an evaluation of eleven federally funded demonstration treatment programs (Cohn, 1979). The study included 1724 parents who received treatment either voluntarily or by court order and who received treatment programs covering the entire spectrum of programs discussed above. On the average, parents were in treatment for six or seven months, and had contact with a provider about once a week. The results indicated that 30% of the parents severely reabused their children while in treatment, and only 42% of families were felt by their therapists to have a reduced potential for future abuse or neglect after therapy. The study also showed that parents who received lay therapy and/or Parents Anonymous as part of their treatment package were more



frequently reported to have a reduced propensity to reabuse than were parents who did not receive these services.

This study also concluded that almost all resources were directed to treating parents, and that children rarely received direct treatment. Three programs offering services to children were reviewed. Results showed that some children improved a great deal, but others made little or no progress. It was not possible to predict which children would do well in treatment.

Green and colleagues (1981) reported the results of a treatment program at the Brooklyn Family Center over a period of three years. Their program also included all of the common treatment methods, and also included approximately weekly contacts with patients. Their evaluation, however, included only 79 patients. Two-thirds of these patients demonstrated some improvement as judged by their therapists, and reabuse occurred in 16% of cases. Patients who entered treatment voluntarily and initially acknowledged having a problem were more successful in their treatment, as were patients who received "extra-psychotherapeutic" intervention.

It is interesting that both of these studies found lay home visits and service-oriented therapy to be key aspects of treatment programs. This conclusion was also reached by Morse and colleagues (1970), who speculated that it might be due to the fact that families tended to perceive protective service workers as being accusing, judging, and prying, and were more likely to develop a positive relationship with lay therapists and visiting nurses.

Even more interesting is the amount of reabuse reported by both studies. Despite the fact that the numbers are very different, both show that although treatment programs are helpful, they are not the answer to



the problem. Because child treatment programs are also not completely effective, many abused children and their families will remain scarred for life. The key to preventing this outcome appears to be in efforts at preventing the occurrence of child maltreatment. These efforts involve identifying families that are at risk for developing maltreatment, and intervening before this outcome can occur.

### Risk Factors

Numerous studies over the past twenty years have attempted to define different characteristics that are more common in abusive families than in the population as a whole. These characteristics have included demographic, social, psychological and historical factors, and are usually observable at the time of birth or before. Most of these studies have been retrospective case-control studies, in which a group of abusive families were compared with a control group of non-abusive families, and each group was examined retrospectively for the presence of particular characteristics before the abusive event occurred. Any characteristic which appeared more often in the abusive families was said to be related to the occurrence of child maltreatment. Although this study design does not allow conclusions concerning causality to be made, it does theoretically identify characteristics which are more common in abusive families and can therefore be used in efforts to identify high risk families.

Unfortunately, these studies have frequently produced conflicting results concerning many of the characteristics studied. The studies have often differed in study design and study population, and this lack of uniformity has undoubtedly contributed to the confusion that has resulted.



Leventhal (1981) described important standards of case-control studies which were often not met by these studies, and which have also contributed to the inconsistent results seen. He mentioned the choice of an appropriate control group, the clear definition of the risk factor being studied, and the equal detection of outcome events among the case and control groups as methodological standards essential to the elimination of bias from these studies.

Despite the fact that many of these studies have produced conflicting results and many have had inadequacies of study design, they have helped to produce a better understanding of the family that might be at risk for child maltreatment. For this reason the results of these studies will be presented.

Prematurity and low birth weight are perhaps the risk factors that have received the most attention from investigators. Unfortunately, this attention has brought much confusion, because many studies have found that these factors are or are not associated with child abuse. Klein and Stern (1971) were the first to study this association. They, like most authors, defined prematurity as gestational age less than 37 weeks and low birth weight as less than 2500 grams. They found the prevalence of both prematurity and low birth weight to be significantly greater in their population of abused and neglected children than in the population of Montreal as a whole. They speculated that the reason for this association might be that small, premature infants tend to spend more time in an intensive care nursery where they are separated from their mothers. This separation, the authors believed, might adversely affect the bonding process, which in turn might predispose to later maltreatment.

Although many studies have agreed with the findings of Klein and Stern, many others have not. Leventhal (1981) reviewed 18 case-control



studies of prematurity as a risk factor for child abuse, and examined them for methodologic flaws. He found only two well-designed studies, both of which concluded that prematurity was not a risk factor. In a subsequent study of his own (Leventhal, 1984), he again concluded that prematurity and low birth weight were not risk factors for child abuse.

Others besides Klein and Stern have investigated the importance of separation and bonding in the neonatal period. Lynch (1975) found a significant association between admission to a special care nursery and later abuse or neglect, as well as significant associations with hospitalization of the infant in the first six months of life and hospitalization of the mother during that period. In a subsequent paper, Lynch and Roberts (1977) commented on the importance of the bonding process in these associations. Ten Bensel (1977) found that mothers who later abused their children took more time before their first visit to their new baby than did a group of control mothers. Fanaroff, Kennel, and Klaus (1972) found that mothers who would later abuse their child visited the child in the intensive care nursery less frequently than did other mothers of low birth weight infants, and suggested that this fact could be used to screen for high risk mothers.

Egeland and Vaughn (1981) reviewed the large body of literature which discussed "bonding failure" as a risk factor for child maltreatment and stated that there was in fact no proof for this theory because there was no adequate measure of bond formation. They argued that certain personality characteristics of the mother, present even before birth, could affect her desire to visit the infant as well as her subsequent mothering patterns. They also argued that these personality characteristics could result in poor prenatal care, which could in turn lead to premature delivery. The authors also pointed out that the higher



prevalence of premature infants and infants hospitalized early in life among maltreated populations could have been due to the fact that these infants were more difficult to care for, and therefore caused their parents more frustration.

Maternal age is another frequently studied risk factor for child maltreatment, and here too the evidence is somewhat contradictory. Kinard and Klerman (1980) reviewed several studies on this factor, and found several methodological problems. One key issue in these studies is the definition of maternal age. Some studies have used the mother's age at the time of the abusive incident, some have used maternal age at the birth of the index child, and others have used maternal age at the birth of the first child. The authors argued that the maternal age at the birth of the first child is the most appropriate for study, because it indicates whether the mother ever suffered the stress associated with teenage motherhood. After reviewing several studies on teenage parenting and making methodological corrections where possible, the authors were still unable to reach a clear decision on whether or not teenage mothers are at increased risk for child maltreatment.

Another controversial issue is the relation between socioeconomic status and child abuse. Early studies of child abuse often stated that the problem occurred more commonly in families of low socioeconomic status (Steele, 1968). Later reviews stated that this was not the case but that differences in diagnosis and reporting patterns resulted in a higher level of reporting in lower socioeconomic levels (Taylor, 1979). It now appears that both might be correct. Jason and colleagues (1982a) reported a study in which they investigated whether different characteristics put a family at risk for reporting of abuse, actual abuse, or both. They compared the incidences of various factors among families in Georgia with confirmed and



ruled-out reporting of child abuse. They proposed that those factors which were more common in the confirmed group were actually risk factors for abuse, whereas those factors which were more common in the ruled-out group were really only risk factors for inaccurate reporting. Their analysis showed low socioeconomic status to be more prevalent among confirmed cases than among ruled-out cases. The study found similar results for large families and families without a biologic mother or father, but found urban residence and teenage motherhood to be associated only with increased reporting.

Several studies have reported on events associated with the pregnancy or delivery. Prematurity, admission to a special care nursery, and the child or mother's illness in the first year of life have already been mentioned. In a study briefly discussed earlier, Lynch (1975) defined abnormal pregnancy as any pregnancy requiring hospitalization for complications, involving concealment or emotional problems, or lacking prenatal care. She found such pregnancies to be more common among abusing mothers. Cater and Easton (1980) found operative deliveries to be more common in abusing mothers. Murphy and colleagues (1981) found that abusive mothers more frequently made their first prenatal visit after 20 weeks, had less than 5 prenatal visits, did not attend prenatal classes, and did not breast feed their child than a group of control mothers. Goldson et al (1978) found abused infants to have had lower apgar scores than a group of control infants. Hunter et al (1978) found consideration of abortion and disappointment over the infant's sex to be antecedents of child abuse.

Several factors associated with family life have also been investigated. Earp and Ory (1980) found family instability and disorganization to be more common among abusive families. Hunter et al (1978) reported family history of abuse or neglect to be a risk factor.



Jason et al (1982a) found large families to be a risk factor for child abuse, and Frodi and Lamb (1980) mentioned overcrowding as a risk factor. Groothius and colleagues (1982) found families with twins to have a higher incidence of maltreatment, and noted that one of the twins or another child in the family could be the victim.

Handicapped and chronically ill children have also been shown by some to be at risk for maltreatment. Glaser and Bentovim (1979) reviewed their experience with maltreated handicapped and chronically ill children at the Hospital for Sick Children in Toronto, and found them to be more often neglected and less often physically abused than a control group of children referred to them because of maltreatment. Martin (1982) speculated that this fact may be due to the parents' difficulty in identifying with, and therefore adequately caring for, their handicapped child.

The psychiatric and personality characteristics of abusive mothers have been studied extensively in search of possible risk factors for child maltreatment. Steele (1980) stated that almost all abusive parents suffered abuse or neglect during their own childhood. He also stated that these parents commonly have inappropriate expectations concerning their child's behavior and development. This was verified by Robison (1979) in a study described earlier. Frank psychosis on the part of the parent must also be considered a risk factor (Kempe, 1971), as must low intelligence (Hunter, 1978) and substance abuse (Milner, 1979).

Numerous authors have characterized abusive mothers as immature, distrustful, impulsive, socially isolated, and having low self-esteem, but attempts to identify a particular abusive personality have been unsuccessful (Egeland, 1979). Gabinet (1979a) administered the Minnesota Multiphasic Personality Inventory to a group of abusive mothers and to a



control group, and found almost no differences between the two groups.

Assessments of risk due to personality characteristics must be subjective, and these assessments will differ from observer to observer.

Increased life stress is considered by many to be a risk factor for child abuse, although this too is often difficult to quantify. Poverty and family difficulties are two of the stresses most frequently mentioned in the literature. The family problems discussed by Earp and Ory (1980) have already been mentioned. Steinberg, Catalano and Dooley (1981) have studied the economic antecedents of child abuse. By studying longitudinal trends in two California counties, the authors were able to show that increases in child abuse were preceded by periods of high job loss. The authors also concluded that economic difficulty was an antecedent of child abuse.

Strauss (1980) reviewed the relationship between stress and physical abuse. He stated that abuse was not a natural result of increased stress, but would only occur in those families in which the parents had learned that violence was an acceptable and helpful means of dealing with their problems. Egeland, Breitenbricher and Rosenberg (1980) agreed with this model. They studied two groups of mothers who had experienced high degrees of life stress, one of which had inadequately cared for their children, and the other of which had provided excellent care. They found the former group to have a higher degree of aggression and suspicion on personality tests, and the latter group to be more open and seeking of support. One can conclude from these studies that although stress is a risk factor for child abuse, only certain families will respond to a high degree of stress by abusing their children.

The previous discussion has identified factors such as prematurity, low birth weight, early separation, maternal age, socioeconomic status, difficulties with pregnancy or delivery, family and life stresses,



handicapped or sick children, and certain psychiatric and personality characteristics as potential risk factors for child abuse. However, the results of the above studies make it clear that no one factor is sufficient to determine whether or not a family is at risk for the later occurrence of abuse or neglect. Child maltreatment is a complex problem, and any attempt to identify high risk families will require an examination of the overall family situation, with attention being paid to many or all of the factors listed above.

### Prediction

The present study is an evaluation of one hospital-based program designed to identify high risk families during the neonatal period. This identification process is based on many of the risk factors discussed above, and involves a non-structured, clinical evaluation of the family by clinicians involved in the family's obstetric and neonatal care. There are still very few descriptions in the literature of early identification programs, and few of these have evaluated their success based on a follow-up of longer than one year. In addition, many of the published studies of high risk screening programs have involved detailed objective evaluations with complex scoring systems, and may therefore not be applicable for use in large populations. The present study is therefore a major contribution to the search for effective means of identifying populations at high risk for child maltreatment.

Altemeier and his colleagues at Vanderbilt University described a study in which they identified high risk mothers on the basis of a prenatal interview (Altemeier, 1979). They developed a standardized structured interview that would last 45 minutes and would be given to



expectant mothers during their wait at a prenatal clinic. The interview addressed information in eight categories: mother's perception of her own nurturing as a child; personality factors; social support available; feelings about the pregnancy; knowledge of parenting skills and philosophy about discipline; family stresses; expectations of child development; and a life stress inventory. Scores were assigned to each category, and mothers were determined to be at high risk if they scored extremely poorly on one or a few categories, or if their overall score was poor.

Fourteen hundred women were given the interview, and 273 were classified as high risk. The infants of these mothers and of a group of control mothers randomly chosen from the low risk group were followed for one year. The incidence of non-organic failure-to-thrive and of reported abuse and neglect were significantly higher among high risk infants. In addition, a total of 18.7% of all high risk children had at least one episode of failure-to-thrive, abuse or neglect.

Hunter et al (1978) studied the families of infants admitted to the newborn intensive care unit of North Carolina Memorial Hospital and attempted to identify those at high risk. They developed a "family psychosocial risk inventory" based primarily on maternal personality characteristics, and determined high risk families based on scores on this inventory. Fifty two of the 282 families studied were considered to be at high risk. Mean duration of follow-up was one year. During this time there were seven foster placements and ten cases of maltreatment among the high risk group, and none of either among the low risk families.

Lealman et al (1983) reviewed the maternity notes of 2802 women in Bradford, England, and used a checklist of predictors to determine high risk. Their checklist included three major factors (young mother, late booking at prenatal clinic, and unmarried mother), and seven minor factors



(step-children in family, psychiatric history, previous referral to a social worker, abortion requested, complications of pregnancy or delivery, baby in intensive care unit, and mother or infant leaving hospital against medical advice). Children were considered high risk if at least three factors, including one major factor, were present. Five hundred eleven children were designated high risk.

This study also attempted to evaluate the effectiveness of preventive interventions, although the interventions were poorly defined. Follow-up was approximately 18 months. Failure-to-thrive and abuse or neglect were far more common in the high risk groups, but the high risk-intervention group did not do better than the high risk-no intervention group. The authors concluded that while prediction of high risk families was possible, the prospects for prevention in these groups were not promising.

These three studies did successfully identify high risk groups that had significantly more bad outcome events than low risk control groups. However, all involved objective rating systems that might be difficult to use on a large population. The study by Altemeier et al involved a 45 minute interview and then a complex scoring system. The time and money required to institute such a program for a long period of time would likely be prohibitive. In addition, it would require the training of many qualified workers to both administer and score these interviews. The North Carolina program would only be applicable to families of infants in intensive care, and would also require large investments of time, training and money. The Bradford study was the least complicated system, and probably could be adapted for use on a large scale without tremendous difficulty.

A study by Gray and colleagues at the National Center for the Prevention and Treatment of Child Abuse and Neglect in Denver involved



both objective and subjective methods of determining high risk (Gray, 1977). This study excluded infants admitted to the newborn intensive care unit. Screening procedures included a prenatal interview and questionnaire, videotapes of interactions in the delivery room, completion of structured forms about delivery room interactions by nurses, subjective analysis of delivery room events, and postpartum interviews and observations. Not all of the procedures were used in each case.

The authors described many of the subjective factors observable during the prenatal, delivery, and post-partum periods that were important to the overall assessment of high risk. Warning signs during the prenatal period included denial of the pregnancy, lack of support from the father or other family members, consideration of abortion or relinquishment, an abusive or neglectful background, and an overcrowded, isolated, or unstable living situation. Warning signs during delivery included disappointment over the baby's sex, lack of eye contact with the baby, hostile reaction, and nonsupportive interaction between the parents. Warning signs during the post-partum period included negative attitude and verbalizations toward the infant, being bothered by the baby's crying, not comforting the baby, and poor support from family members.

This study also attempted to evaluate the effectiveness of interventions aimed at preventing poor outcomes. Interventions included care by one pediatrician who contacted the mother by phone shortly after hospital discharge, provided more frequent office visits, and provided more attention and support to the mother. Interventions also included weekly visits to the home by a public health nurse.

The study involved 50 high risk-intervention mothers, 50 high risk-no intervention mothers, and 50 low risk control mothers. Controls were chosen randomly from all mothers delivering at the same hospital; there



was no matching. Follow-up ranged from 17 to 35 months, with a mean of 27 months. There were significantly more incidents of abuse, neglect, and foster placement among high risk infants than among controls, but there were no differences in immunization or developmental status. There were no differences noted between the intervention and no intervention groups.

In a later review of this study, Kempe (1978a) noted that the subjective evaluations of high risk, such as routine observations by nurses and doctors in labor, delivery room, and post-natal care, were the most helpful determinants of high risk. The more invasive techniques, such as questionnaires and interviews, were found to be less helpful. The subjective evaluations are the easiest and most efficient methods of evaluation, and their success in this study led to their incorporation into many other programs. The program evaluated in this study is based largely on these methods.

Ounsted et al (1982) described a system of prediction and prevention in Oxford, England that is very similar to the program at Yale-New Haven Hospital, but their evaluation of the program had no control group other than a historical control. Mothers are referred to this program by a midwife who is concerned about their interaction with their baby. In the first year of operation, 109 families were referred. In 27% of these cases, the midwife's main concern was that the parents were unable or unwilling to care for their baby. In 15%, concern was due to a known psychiatric history. Fourteen percent of the mothers were referred because there were marital problems "of such gravity that the baby's safety was thought to be at risk." In several cases this was due to marital violence. Eight percent were referred because of previous abuse or "bonding failure" to other children. Illness or handicap of the mother was responsible for 4% of referrals. Seventeen percent of the mothers were referred because of



diffuse social problems, and 4.5% were referred because of specific social problems such as poor housing or low income.

Interventions in this study included alerting the family doctor of the high risk determination, counseling from a pediatrician consultant, and occasionally more serious psychiatric involvement. Notification of the family doctor was the only intervention used in 60% of cases. Follow-up was at one year of age. There were no instances of abuse or neglect among study families during this time. Families involved in this program therefore did better than those with infants born in the 18 months before the program was started.

Beswick, Lynch and Roberts (1976) described the efforts of a general family practice to predict and prevent child maltreatment, but they offered no evidence of its effectiveness. Their emphasis was on the recognition of early-warning signals in families at any time during the life of the child. They believed that the family doctor is in a good position to recognize vulnerable parents because he or she has known the parents for a long time, is aware of particular family problems, and can notice early warning signals before others who are less familiar with the family. Upon suspecting the potential for abuse, the authors made available various interventions such as a 24 hour hotline, child care, and referral to other agencies. Their efforts are particularly important in view of the well-known tendency of family doctors to ignore the signs of maltreatment, even when they are blatantly obvious (Taylor, 1979).

In 1981, an unpublished medical student thesis evaluated the Yale-New Haven Hospital DART Committee's program for identifying high risk newborn infants (Ross-Asciutto, 1981). Ninety eight newborns born between 1971 and 1978, followed regularly at the hospital's Primary Care Center, and identified as high risk by the DART Committee, were studied by means of a



retrospective chart review for the first several years of life. Seventy one of these infants received an intervention in the form of continuing care from one pediatrician who would hopefully establish a strong relationship with the family. Twenty five study infants were abused or neglected, one died, five were placed in a foster home, and 23 suffered trauma under the age of one. In each outcome category, the intervention group did better than the no intervention group. The study contained no low risk control group, however, so the overall accuracy of the high risk determination was not clear.

The present study reviews the same high risk identification program as that studied by Ross-Asciutto. The program is based on many of the subjective clinical indicators outlined by Gray et al, and is similar in format to that of Ounsted et al. The study also reviews the effectiveness of an intervention program similar to those already described. It differs from all previous studies in that it compares the outcomes of a high risk group to the outcomes of a group of matched controls who were not identified as high risk, and the mean duration of follow-up is over 3 years.

It is important to note that there is little value in identifying high risk infants if effective interventions cannot be offered to them and their families. Many have noted, in fact, that identifying such a population in the absence of effective interventions might actually be harmful because of the resentment and isolation that might result from such labelling (Martin, 1982). However, it is also clear that in order to develop and test appropriate interventions, a high risk treatment population must first be identified. With this ability now becoming established, it is important to work now to make effective interventions available.



### Prevention

The goal of early intervention programs is not only to prevent actual physical injury, but to prevent also the many less severe aspects of maltreatment and their long-term sequelae (Martin, 1982). Many of the treatment programs discussed in an earlier part of this review are also essential aspects of early intervention programs. In particular, these include lay and traditional therapy, day care, hotlines, self-help groups such as Parents Anonymous, substance abuse programs, visiting nurses, and economic assistance.

Several of the interventions offered by Gray et al in their study discussed above have become part of many similar intervention programs (McNeese, 1977). These include continuity of care from one pediatrician, increased frequency of office or clinic visits, phone contact with the parents, paying more attention to the mother's needs, increased attention to accident prevention, and counseling about methods of discipline. Increased attention to promoting parent-infant bonding during the neonatal hospitalization is another aspect of many intervention programs.

In a 1975 lecture before the Ambulatory Pediatrics Association, Kempe proposed a new approach to preventing child abuse (Kempe, 1976). He proposed the development of a nationwide system of lay health visitors that would provide universal home health care to all children in the United States. The idea was based on successful programs in many Scandinavian countries, and would involve recruiting successful mothers who were willing to share their experience and goodwill with other young families. The goal of the proposed program was to have lay visitors visit children in their homes regularly, several times during the first year and less frequently thereafter, and to make sure that they were receiving



adequate care. The lay visitor would also be able to recognize those families that were at risk for maltreatment, and could mobilize appropriate help for them.

The proposal of such a nationwide system may have been somewhat overambitious. Kempe tried to justify his proposal by pointing out similar programs in other countries and by pointing out several mandatory screening programs for very rare diseases in this country. But not surprisingly, a national lay health visitor program has not been developed. Several communities and medical centers have developed small scale programs based on Kempe's proposal, however, and these programs have been successful.

Gray and Kaplan (1980) described their experience with such a program in Denver. A lay health visitor was offered to each woman who delivered a baby at Colorado General Hospital and who lived in Denver County. It was felt that this approach prevented the stigma of labelling families as high risk. The visitors were trained briefly in areas such as child-rearing skills, community resources, observational skills, and the dynamics of child abuse. They then began to become involved with families, starting with a visit to the maternity ward, and then following up with home visits. Five hundred fifty families participated in the program during its first 18 months. Most cases were closed in 2 or 3 months, although 1/3 of the cases were open for longer than 6 months. The authors reported that only 2 children involved in the program during this time had episodes of abuse or neglect. Formal evaluation of the program had not been completed at the time of their report. The authors noted that lay visitors may be more effective than professionals because they often appear less judgmental and less threatening, and the families are therefore more willing to trust and befriend them.



Armstrong (1981) described a different type of program aimed at preventing the occurrence of child maltreatment in high risk families. The program received referrals from other agencies that believed families to be at high risk. The program involved home-based assistance, a family school, and neighborhood peer support groups. A social worker or a pediatric nurse counselor visited the home and functioned much like a lay health visitor. Family school was attended by the parent and the child, and goals included teaching parenting skills, developing better communication, and developing the child's ability to trust the mother. After completing a family school session, parents formed peer support groups to help them to continue their improvement.

At the time of Armstrong's report, 74 families had completed an average of 10 months in the program. There were 4 occurrences of child abuse or neglect during this time. Comparing this outcome with the outcomes of high risk families described by a report in the literature that received no interventions, the author concluded that the program was effective in diminishing the occurrence of maltreatment.

Gabinet (1979b) described a very different program aimed at preventing child abuse and neglect. This program also received referrals from other agencies that had already made the diagnosis of "child abuse potential." The program was based on the belief that stress played a crucial part in the occurrence of abuse, and was therefore aimed at helping the parents deal with their response to stress. Parents were visited in their home by "psychology assistants," who were college graduates specially trained in psychology and psychotherapy. The work of these assistants was based on dynamic personality theory. Workers evaluated the improvement made by parents based on a completely subjective scale, and the results indicated that improvement increased with time spent in the program. There was no



evaluation of child outcomes. This program obviously required skilled workers with much training, and is therefore not very applicable for large scale use.

One intervention program advocated by many authors and seemingly very easy to institute is parent education programs in the high schools. Aside from peripartum hospital visits, the high schools are the most effective means of reaching most future parents. Such programs could teach future parents about normal child development and behavior, and about methods of communication and discipline. A curriculum called "Exploring Childhood" was developed by the Public Schools of Newton, Massachusetts, and has been used in over 200 schools (Schmitt, 1980b).

The field of child abuse and neglect has come a long way. In only 22 years it has come from a problem unknown or ignored by physicians and others to a well-defined, identifiable syndrome with many efforts being made towards its treatment. It is now at the stage where prediction and prevention are the focus of much work in the field, and it is hoped that the current study will add to the success of these efforts.



## METHODS

### Subjects

High risk cases were obtained from the DART registry in the Yale-New Haven Hospital (YNHH) Pediatric Emergency Room. All infants born at YNHH in the years 1979 and 1980 and referred to the DART registry during the initial newborn hospitalization because of presumed high risk for the later occurrence of child abuse or neglect were reviewed for eligibility for the study. Infants were eligible for the study if they had not already been abused at the time of referral, and if they received at least some of their well child care at the Yale-New Haven Hospital Primary Care Center (PCC) or one of the other primary care centers discussed below. Infants were ineligible for the study if their case was either put on "hold" by the DART Committee pending further information or rejected by the committee, or if they were not involved in the primary care network of this study before the age of eighteen months. Twins were excluded from the study because of their documented increased susceptibility to abuse (Groothius, 1982), and because of the difficulty in finding appropriate comparison infants.

Comparison cases were obtained from the YNHH birth logs and from the hospital's sickle cell disease screening logs when necessary. For each high risk infant, one matched comparison infant was chosen. For those born after March 1979, when the hospital's birth logs were first computerized, the birth logs were searched starting on the date of birth first forwards 2 months and then backwards 2 months if necessary. The nearest-born infant matched for sex, mother's race, and method of payment for the



hospitalization who also received at least some of his or her well child care during the first 18 months of life in the primary care network described below was selected as the matched comparison. The 3 high risk infants whose method of payment could not be determined were considered to be Title 19 for the purpose of matching because the overwhelming majority of high risk infants fell into this category.

For exposed infants born between January and March 1979, comparison infants were found as follows. All black and hispanic infants born at the hospital are screened for the presence of sickle cell disease. The screening logs were reviewed and used to find infants matched as above for black and hispanic cases born during this period. Comparison infants for white exposed cases born during this period were found by reviewing the birth logs for April and May 1979 that were on the computer. All exposed and nonexposed infants were matched for sex, race, and method of payment, and were born within 5 months of one another.

#### Data Collection

Each study patient's medical record was reviewed chronologically from birth until the time of this study, when patients were either 4 or 5 years of age. The following categories of data were studied for each patient: reason for DART referral, baseline information, interventions, and outcome. An abstraction form was prepared and was used to abstract data from the patients' medical records.

YNHH hospital charts include all in-patient and out-patient visits to the hospital. Separate out-patient charts were therefore not routinely reviewed, but were reviewed in those instances in which it was suspected that some data were missing from the hospital chart. In no instance was



any useful information found in the out-patient chart that was not also in the main hospital chart

The patient logs of The Hospital of Saint Raphael (HSR), the only other hospital with pediatric patients in the New Haven area, were reviewed by computer for the presence of any study patients. The charts of all such patients who had ever been to HSR for any type of in-patient or out-patient care were reviewed, and all pertinent data were abstracted.

In addition to the two hospitals, there are two neighborhood health centers in the New Haven area which provide primary care to pediatric patients and are closely affiliated with Yale-New Haven Hospital. These are the Hill Health Center (HHC) and the Fair Haven Community Health Clinic (FHCHC). Because of small staffs and the absence of computerization, it was not possible to review the patient logs of these clinics for the presence of study patients. Instead, those patients whose YNHH chart showed any evidence that they had visited either of these clinics had their records at these clinics reviewed and abstracted.

The primary care centers and emergency rooms of Yale-New Haven Hospital and The Hospital of Saint Raphael are staffed by the same resident physicians and provide similar types of care. Although staffed by different physicians, the two neighborhood health centers serve similar populations and also provide care very similar to that provided at the two hospitals. Because all information used in this study was obtained from visits to these health centers, and most was obtained from visits to YNHH, it can be assumed that there was no detection bias in the way the two groups of patients were followed for the different outcomes in this study.

Patients are referred to the DART Committee by a social worker who has seen both the infant and the mother, and who is familiar with the mother's case. The social worker completes a DART referral form which is then sent



to the committee. This form was reviewed for each exposed patient, and the reason or reasons for referral were determined. Only information listed on the form under the section entitled "Reason for Referral" was considered. Information obtained elsewhere on this form or in the patient's chart was not considered to be a reason for referral, even if the information might be expected to lead to referral, because the purpose of this study was to examine those reasons for which patients were actually referred and whether such a system is effective.

After all of the exposed patients' charts had been reviewed, the many reasons for DART referral were tabulated, and those that were sufficiently similar were grouped together for purposes of computer coding. The groups of referral reasons were arranged in order of decreasing seriousness according to the reviewers' determination. The resulting list is shown in Table 1. Many reasons are direct quotes from the DART referral forms.

Baseline data were obtained on both exposed and nonexposed patients to determine whether the two groups differed significantly in non-matched variables that have been previously associated with the occurrence of child abuse. This information includes gestational age, birth weight and length, apgar scores, maternal age at delivery, type of delivery, neonatal complications, duration of neonatal hospitalization, and medical or surgical hospitalizations during childhood and their severity. Neonatal complications and medical/surgical hospitalizations were recorded as either minor, moderate, or major, according to the classifications shown in Tables 2 and 3.

Data were also obtained on any potentially protective or preventive interventions, directed either at the child or its parents, that might have had an effect on later outcomes. Such interventions included social service involvement, which by definition occurred in all exposed families,



referral to the Department of Children and Youth Services (DCYS), the State of Connecticut's childhood protection agency, referral for psychiatric evaluation or treatment, placement of a child in foster care directly from the hospital as a preventive measure, parent-aide referral, home-maker referral, visiting nurse referral, parent support groups, infant developmental play groups, and infant stimulation groups. Information concerning whether and when referral was made to any of the above services, and whether the family accepted or refused, was obtained from the charts of both exposed and nonexposed patients when available.

Outcome information was divided into the following categories: well child care and development, injuries, sexual abuse, and placement and change of guardian. Data in the first category included sources of well child care, problems with well child care attendance as noted by remarks in the medical record by a physician, nurse-practitioner, or social worker, remarks in the hospital chart about poor infant hygiene, weight percentile corrected for gestational age at visits near each of the first three birthdays, age at receipt of the MMR and fourth DPT immunizations, developmental data, any mention about poor mother-child interaction in the medical record, and inappropriate visits to the Emergency Room with a healthy child. The latter is often considered to be a call for help by a parent feeling overwhelmed (Kempe, 1978a).

Development was assessed by reviewing the written remarks made at well child care visits. Such remarks usually stated that the child's development either was age-appropriate by the Denver Developmental Screening Test, or was delayed to some degree in one or more of the areas tested by this screening test. These remarks and the child's age when they were made were recorded, but the actual Denver test sheet in the patient's chart was not reviewed.



Injury events usually involved Emergency Room visits for major or minor trauma, but occasionally involved an injury discovered at a well child care visit. Emergency Room visits for colds, sore throats, earaches and other similar maladies were not recorded. For each injury event, the patient's age and type of injury were recorded, as well as whether DCYS or the DART Committee was involved, whether hospitalization occurred and its duration, and whether any permanent damage to the patient resulted.

The injuries were classified into the following categories: death, head injury with neurologic damage, subdural hematoma, skull fracture, multiple fractures, fracture, head bump or concussion, head or face laceration or abrasion, other laceration or abrasion, minor soft tissue injury, burn, major burn for those burns involving more than three percent of the body surface area or requiring a skin graft, ingestion, duodenal hematoma, dislocation, dog bite, human bite, swallowing penny, lead poisoning requiring chelation therapy, falling from bed with no major injury, motor vehicle accident with no major injury, kidnapping without injury but resulting in a medical visit, and abuse over a long period of time with no specified injury. If more than one category was appropriate, the more serious one was used. No injury was said to occur in incidents in which pure neglect or medical neglect occurred.

For each injury event a cause was determined in retrospect by both the person reviewing the chart (RBG) and a blinded reviewer (JML). The blinded reviewer was unaware of the patient's exposure status and demographic characteristics, and based his decision on information abstracted from the chart by the chart reviewer. Decisions on causes were based on all available data in the patient's chart, including history, physical examination, whether the two appeared compatible, and the assessment of involved physicians and social workers. The assessments of involved



clinicians were usually given highest priority, because it was assumed that they had more information available to them than was actually recorded in the medical record.

Causes of injury were as follows. Definite Abuse was defined as any definite intentional act causing physical harm to the child. This included incidents in which a history from an unbiased source was unequivocal for intentional abuse, incidents with a radiologic battering series revealing numerous old fractures of differing ages, and incidents in which the physical examination revealed evidence of definite physical abuse, such as belt marks or hand-shaped bruises.

Probable Abuse was defined as an incident for which most information indicated an intentional act, but where this information was not beyond reasonable doubt. This included incidents in which physicians felt abuse was "very suspicious" in view of the history, but could not be completely convinced, and incidents in which other signs of past injury were not likely consistent with accidental injury but in which the history did not prove abuse.

Questionable Abuse was defined as an incident in which abuse was suspected on the basis of the history, but where there was no real evidence to substantiate this suspicion. Such injuries were not explainable by neglect.

Abuse/Neglect was used to describe those incidents in which the reviewer could not decide between abuse and neglect on the basis of information about the incident available in the chart. Available information would, however, make accident an unlikely explanation.

Neglect/Accident was used to describe those events which the reviewer believed were accidental in origin, but which would likely have been preventable by reasonable parenting methods, or events in which abuse was



unlikely but for which either neglect or accident may have been the cause. Examples include falling down the stairs before the age of 1 year, the first incident of an infant less than 1 year old falling off a bed, the first two episodes of ingestion, lead poisoning requiring chelation therapy after the first incident, and a parent dislocating a child's radial head by lifting the child by the arm.

Neglect was used to describe those incidents which the reviewer believed would require a complete lack of parental supervision to be allowed to occur, a pattern of accidents indicating neglectful parenting, or pure neglect without injury, such as the failure to provide adequate food, shelter, or clothing. Examples include any iron burn that is not considered abuse, a laceration resulting from playing with a broken mirror, the second or third episode of a young infant falling from a bed, and the third episode of an ingestion.

Medical Neglect was used to describe any occurrence of inadequate medical care leading to the involvement of DCYS or the DART Committee. This would include the lack of adequate well child care as well as the lack of special medical attention required for a serious medical problem. Poor hygiene and occasional poor clinic attendance would not constitute Medical Neglect unless they led to the involvement of either DCYS or the DART Committee.

Accident was used to describe incidents and injuries which would not likely have been preventable by reasonable parenting methods. Examples include the many lacerations and abrasions young children often suffer as a result of play or other routine activity, the first incident of lead poisoning requiring chelation therapy, and the accidental swallowing of a penny.

Accident/Household Violence was used to describe an accidental injury



to the child occurring as a result of violence within the home involving one or both parents but not directed at the child. This category is separate from the accident category because it does indicate an unfavorable outcome to the child resulting from some degree of poor parenting. An example would be an infant who was accidentally injured during his father's unsuccessful attempt to injure his mother.

Incidents of presumed sexual abuse were determined by the blinded reviewer to be either definite, probable, or questionable on the basis of available evidence. Also recorded for each episode were the patient's age at the time of the event, and whether or not DCYS and the DART Committee became involved. In addition, it was recorded whether the suspected perpetrator was the victim's father, the mother's boyfriend, another person in the household, another person outside the household but known to the patient's family, or somebody not known to the family.

Incidents in which the child was placed in a relative or foster home were considered separately from incidents in which the child's mother left the home and a new person became the guardian. This distinction was made because it was felt that these represented very different outcomes for the child, as well as different types of parenting failure. Although there was occasionally some overlap, a change of guardian in the same home usually resulted in less disruption in the child's life because the new guardian was either the grandmother, father, or aunt who had already been living with the child, and usually occurred because the mother went to jail or to an in-patient psychiatric or drug treatment program which would not necessarily indicate that she was performing poorly as a parent. On the other hand, placement resulted in a change in environment for the child with an often unfamiliar new guardian, and usually was the result of a more clear-cut parenting failure such as abuse, failure-to-thrive,



neglect, or abandonment.

For each episode of foster placement, the child's age, the reason for placement, and whether or not DCYS was involved were recorded. The duration of placement was recorded as accurately as possible from the information available in the medical record. Placement was considered permanent if there was evidence of termination of parental rights or change in custody in the medical record.

For each episode of new guardian without placement, the child's age, the reason for the change in guardian, the relation of the new guardian to the child, and whether or not DCYS was involved were recorded. The duration of the episode was determined in the same manner as for episodes of foster placement, and was recorded.

### Analysis

The data were transferred from the abstraction form to a computer coding form, and were then keypunched at the Yale Computer Center. All data analysis was performed on Yale Computer Center computers using the Statistical Analysis System (SAS). Statistical analysis of the difference in proportions between the exposed and nonexposed groups was by the chi-square test for paired samples, and analysis of the difference in means between the two groups was by the t test for the difference of means within each matched pair. Analysis of comparisons within the exposed group was by the chi-square test for independent samples.

Stratification was used to control for differences between the two groups in certain baseline characteristics. For a given non-matched characteristic, all exposed-nonexposed pairs in which the exposed patient had the characteristic and the nonexposed patient did not were eliminated



from the analysis. Pairs in which both patients either had or did not have the characteristic, or in which the nonexposed patient had the characteristic and the exposed patient did not, were not eliminated from the analysis. This method of stratification slightly biases the analysis away from finding a significant result.

Review

This study was reviewed and approved by the Human Investigations Committee of the Yale University School of Medicine, protocol number 3307, and by the Human Investigations Committee of The Hospital of Saint Raphael, protocol number 526. It was also reviewed and approved by the appropriate committees at both the Hill Health Center and the Fair Haven Community Health Clinic. Patients at the latter clinic were contacted by mail and were given the opportunity to refuse to have their medical records reviewed.



## RESULTS

### Baseline Characteristics

During the years 1979 and 1980, 117 patients were referred to the DART Committee during the newborn period because of suspected high risk for the later occurrence of child abuse or neglect. Six of these were twins and were therefore ineligible for this study. Five patients were put on "hold" by the committee pending further information, and six were rejected by the committee. These patients were also not eligible for the study. Of the remaining 100 patients, 21 were not involved in the primary care network of this study. Fourteen received care from a private pediatrician in the New Haven area, 2 received care from Health Maintenance Organizations in New Haven, 3 received care in distant Connecticut cities, 1 received care in California, and there was no information on where 1 patient received care.

The study population therefore consisted of 79 high risk patients and 79 matched comparison patients. The matching variables are summarized in Table 4, and the important non-matched baseline variables are summarized in Table 5. The exposed and nonexposed groups differed significantly in the proportion with mothers under age 18, the proportion with gestational age less than 37 weeks, mean number of days in the Newborn Special Care Unit and the proportion with greater than 5 days in the unit, and the proportions with moderate neonatal complications and major and moderate medical/surgical hospitalizations. The last column of Table 5 indicates the relative risk (RR) for the exposed patients compared to the nonexposed patients.



### Reasons for DART Referral

The number of exposed patients with each of the reasons for DART referral as either the most serious reason for referral or as any of the reasons for referral is shown in Table 6. Sibling neglected or with failure-to-thrive or poor well child care was the most common reason for referral, and mother with psychiatric problems was a close second. Mother with a history of drug abuse was the number three reason for referral. Three patients were referred because a sibling had been abused, and 7 because a sibling had been voluntarily placed. Eleven patients each had Young Mother and Poor Prenatal Care/Delivery at Home as a reason for referral, but only one patient had each of these as the most serious or only reason. Similarly, 11 patients had Conflict/Violence in Family as a reason for referral, but in only 5 was this the most serious reason.

### Interventions

Information on whether interventions offered to families of exposed patients were accepted or rejected, and on the duration and extent of accepted interventions, was incomplete because there was often no documentation in the medical record. There are no social service files with this information. Table 7 summarizes available information on post-partum interventions.

By definition all exposed families were referred to Social Services. Sixty four families were referred to the Department of Children and Youth Services during the post-partum period, but DCYS refused to accept 4 of these. Forty three families were offered a visiting nurse for some length of time during the post-partum period, but 6 mothers refused this offer.



Four infants were placed from the hospital into a different home for some length of time as a preventive measure; three voluntarily and one by court order. Eight mothers received a parent-aide during the post-partum period, 3 received a family advocate, and one received a home-maker. Fifteen mothers received psychiatric evaluation and/or treatment during the post-partum period, 2 were referred to a methadone program, and one was referred to a program for mentally retarded adults.

Outcomes--Exposed vs Nonexposed

The mean age at last contact with the medical care system of this study was 38.4 months for exposed patients and 40.1 months for nonexposed patients ( $t=0.79$ ,  $P>.05$ ). The sources of well child care of the patients in this study are shown in Table 8. As the table demonstrates, the majority of patients received their care from one of the study locations throughout the duration of the study. Some patients did change the source of their care to a local or distant pediatrician, some patients came into the study system after having received previous care elsewhere, and some patients moved in and out of the system. Since the records of both pediatric emergency rooms in New Haven were reviewed, it was assumed that most or all injury events in those study patients who received their care either within our system or at a local pediatrician were reviewed for this study.

One high risk child died before receiving any well child care. The patient had been assigned a pediatrician in the PCC and had been given an appointment there, and the patient's mother had spoken with the pediatrician by phone on two occasions. For this reason the patient was considered to be a part of the PCC system, and was eligible for this



study. The patient presented Dead on Arrival to the Yale-New Haven Hospital Emergency Room at the age of 3 weeks. The parents were unable to give a history of what happened to the child. Autopsy examination revealed a complete absence of any food in the gastro-intestinal tract, indicating that the infant had not been fed in at least 2 days. The incident was considered to be neglect by both reviewers.

In addition, information on one exposed patient was incomplete because Volume I of a two volume hospital record could not be located. Information on this patient was obtained by reviewing Volume II of his record, his mother's record, and his out-patient record.

Data on well child care and development for exposed and nonexposed patients are presented in Table 9. Forty one percent of exposed and 34% of nonexposed patients had some evidence of poor well child care attendance ( $\chi^2=0.58$ ,  $P>.05$ ). Late or missing immunizations are another indicator of poor well child care. Fifteen exposed and 10 nonexposed patients either received their MMR immunization after the age of 20 months, or there was no evidence in the medical record of their ever having received their MMR. Patients lost to follow-up before this age were not included. This difference was not significant ( $\chi^2=1.47$ ,  $P>.05$ ), but 29 exposed and only 12 nonexposed patients either received their fourth DPT immunization after the age of 2 years or not at all, a difference that was significant ( $\chi^2=9.97$ ,  $P<.01$ ).

Ten percent of both exposed and nonexposed patients had at least one weight less than or equal to the fifth percentile after correction for gestational age. One patient from each group was hospitalized for failure-to-thrive, but a total of 6 exposed and 1 nonexposed patients were considered to have non-organic failure-to-thrive by their physician ( $\chi^2=3.57$ ,  $P>.05$ , RR=6.00). The differences between the two groups in



each degree of developmental delay were small and did not approach statistical significance.

Poor infant hygiene was noted in 2 exposed patients and 1 nonexposed patient. Poor mother-infant interaction was noted in 4 exposed patients and no nonexposed patients, a difference that was significant ( $\chi^2=4.00$ ,  $P<.05$ ). Inappropriate ER visits were noted in 3 exposed infants and no nonexposed patients, but this difference was not significant ( $\chi^2=3.00$ ,  $P>.05$ ).

The total number of episodes of each cause of injury as determined by the chart reviewer and the blinded reviewer are presented in Table 10. The two reviewers were clearly very much in agreement on most episodes. The remainder of the results presented on injury events will therefore refer only to the cause as determined by the blinded reviewer. Interestingly, although there were more episodes of abuse and neglect among the exposed patients, there were far more episodes of accident among the nonexposed patients.

Table 11 demonstrates the total number of patients from each group who had at least one injury due to the causes listed. There were statistically significant differences between the two groups in the number of patients with definite abuse ( $\chi^2=4.00$ ,  $P<.05$ ), and neglect ( $\chi^2=4.76$ ,  $P<.05$ ). There were 2 exposed patients and no nonexposed patients with probable abuse, but this difference was not significant ( $\chi^2=2.00$ ,  $P>.05$ ). There were 4 exposed and 3 nonexposed patients with medical neglect ( $\chi^2=0.14$ ,  $P>.05$ ), and 1 patient from each group was the victim of an episode of accident/household violence. Again, more nonexposed patients than exposed patients suffered accidental injuries.

A summary variable "maltreatment" was an indicator of the number of patients with at least one episode of definite abuse, probable abuse,



question abuse, abuse/neglect, neglect, or medical neglect. There were significantly more patients suffering "maltreatment" among the high risk group than among the comparison patients ( $\chi^2=6.00$ ,  $P<.05$ ). This variable was also used to compare different subgroups of high risk patients, as will be discussed later in this section.

The types of injury suffered by patients in each group are shown in Table 12. There was only one death, occurring in the exposed patient described previously. There were three episodes of neurologic damage, all occurring in exposed patients, and two incidents of long term abuse, also both occurring in exposed patients. The one duodenal hematoma occurred in an exposed patient. There were 16 burns in exposed patients, one requiring a skin graft, and only 7 burns in nonexposed patients. There were equal numbers of fractures and ingestions in the two groups. Interestingly, there were many more lacerations and abrasions in the nonexposed patients, which may explain the greater number of accidents in this group described previously. The greater number of incidents of "no injury" among exposed patients is likely a result of the larger number of episodes of neglect seen in this group.

Three exposed patients suffered permanent damage including death, neurologic damage, and skin graft. No nonexposed patient suffered any permanent damage. The total number of days hospitalized as a result of injury events was 301 for the exposed group and 20 for the nonexposed group. For injuries due to definite abuse, probable abuse, neglect, or medical neglect, total days hospitalized were 230 and 0, and for injuries due only to definite or probable abuse, total days hospitalized were 132 and 0.

The one episode of definite sexual abuse in this study occurred in a nonexposed patient ( $\chi^2=1.00$ ,  $P>.05$ ). The perpetrator was known to the



family. There were no episodes of probable sexual abuse. The two episodes of questionable sexual abuse both occurred in exposed patients ( $\chi^2=2.00$ ,  $P>.05$ ). The perpetrator was the father in one of these instances, and was unknown to the family in the other.

Twenty six exposed patients had at least one placement, compared to 4 nonexposed patients, a significant difference ( $\chi^2=16.13$ ,  $P<.001$ , RR=6.50). Two of the exposed patients had 2 separate placements. One was temporarily removed from the mother by the court after an episode of definite abuse but was given back to her by the court, only to be removed permanently after the third episode of definite abuse. The other was abandoned by the mother and left in the care of the grandmother, and was later put in the custody of DCYS after being neglected by the grandmother.

The reasons for placement and durations of placement are shown in Tables 13 and 14 . As already mentioned, 4 exposed patients were placed from birth for preventive reasons. If these 4 placements are not counted as outcomes, the difference in placements between the two groups remains significant ( $\chi^2=12.46$ ,  $P<.001$ ). Four exposed and 3 nonexposed patients were placed due to neglect, failure-to-thrive, or medical neglect. Two exposed and 1 nonexposed patients were abandoned by their mothers and left in the home of a friend or relative. One exposed patient was placed because of a housing crisis, and one was placed because the mother was an alcoholic. One young mother and her infant were placed in a foster home temporarily because her family support system fell apart. There was no information available in the medical records of 4 exposed patients to explain why they had been placed.

There were 7 permanent placements among exposed patients and none in nonexposed patients, a statistically significant difference ( $\chi^2=7.00$ ,  $P<.01$ ). In addition, 2 exposed patients were placed for between 1 and 2



years, and 1 was placed for longer than 2 years. Information on duration of placement was not available in the medical records of 8 exposed patients and 2 nonexposed patients.

Thirteen exposed patients had a change of guardian, compared to no nonexposed patients, also a significant difference ( $\chi^2=13.00$ ,  $P<.001$ ). One of these patients also had a subsequent placement episode, with the mother caring for the child between the two events. Seven episodes resulted from the mother leaving voluntarily, 4 from the mother going for psychiatric or drug treatment, and 2 from the mother going to jail. The new guardian was the maternal grandmother in 9 instances, a maternal aunt in 3, and the father in 1. One episode lasted less than 1 month, 4 lasted between 1 and 3 months, 2 lasted longer than 2 years, 2 were permanent, and the duration was unclear in 4 episodes.

As an overall indicator of poor outcome, a total of 38 high risk patients (48%) suffered at least one episode of abuse, neglect, sexual abuse, placement, or change of guardian, compared to only 9 patients (11%) who were not considered at high risk. This difference was highly significant ( $\chi^2=21.56$ ,  $P<.001$ ).

#### Outcomes by Reason for Referral

Attempts to find particular reasons for DART referral which were associated with a greater risk for poor outcome than the high risk group as a whole were unsuccessful. The following eight reasons for referral were thought to be the most serious: sibling abused, sibling neglected, sibling voluntarily placed, mother with psychiatric problems, mother with drug problems, mother mentally retarded, mother alcoholic, and mother abused or neglected as a child. Sixty four of 79 exposed patients had one



of these eight reasons as their most serious reason for referral. Five of these 64 patients (8%) had at least one episode of definite or probable abuse, compared with 2 of the remaining 15 patients (13%) ( $\chi^2=2.69$ ,  $P>.05$ ). Similarly, 16 out of 64 patients (25%) with one of these reasons for referral had at least one episode of definite or probable abuse, neglect, or medical neglect, compared with 3 out of 15 patients (20%) without any of these reasons for referral ( $\chi^2=0.17$ ,  $P>.05$ ).

A different attempt involved assigning each reason for referral a number from 1 to 28, with lower numbers indicating a more serious reason for referral. Numbers were assigned to reasons from top to bottom as listed in Table 6, with Sibling Abused being 1 and Disappointed over Baby's Sex being 28. The reasons for referral for each exposed patient were then summed and the 19 (25%) patients with the lowest sums were compared with the remaining 60. Four of 19 (21%) had definite or probable abuse or neglect or medical neglect, compared with 15 of 60 (25%) ( $\chi^2=0.01$ ,  $P>.05$ ). Other attempts to separate patients by different reasons for referral and to compare their outcomes to the remainder of the high risk group all failed to show significant differences.

#### Effects of Interventions

In an attempt to determine whether interventions offered to high risk families were effective in altering future outcomes, exposed patients were divided into two groups according to whether or not they had received one of the following four major post-partum interventions: voluntary preventive placement, court-ordered preventive placement, parent-aide, and family advocate. Only 14 patients were in the group that received these interventions; the other group consisted of the remaining 65 exposed



patients.

The mean age at last contact with the medical care system of this study was 32.6 months for the patients who received a major intervention, and 39.6 months for those who did not. This difference was not significant ( $t=0.50$ ,  $P>.05$ ). A comparison of outcomes in these two groups is shown in Table 15. Although all five patients with episodes of definite abuse received no major intervention, this difference was not significant ( $\chi^2=1.14$ ,  $P>.05$ ). The incidence of neglect was 18% in the group without major intervention and 7% in the group with major intervention, but this difference was also not significant ( $\chi^2=1.04$ ,  $P>.05$ ). The proportion of patients with "maltreatment" was 25% in the group without major intervention and 21% in the group with major intervention. This difference was again not significant ( $\chi^2=0.05$ ,  $P>.05$ ). There was a significant difference in the proportion of patients with neglect/accident between the two groups ( $\chi^2=4.33$ ,  $P<.05$ ).

Table 16 illustrates the different types of injury that occurred in the two groups. All episodes of death, neurologic damage, long term abuse without specific injury, duodenal hematoma, major burn, and ingestion occurred in the group without major intervention. Both episodes of fracture occurred in the group with major intervention, but both were accidents. Burns occurred in 29% of patients with major intervention and in 19% of patients without intervention.

#### Controlling for Baseline Differences

Attempts were made to control for the non-matched baseline variables in which there were significant differences between the exposed and nonexposed groups. Tables 17 and 18 show the results of a comparison of



the two groups when all exposed-nonexposed pairs in which the maternal age was less than 18 in the exposed and not in the nonexposed case were eliminated. Eighteen pairs were eliminated, leaving 61 pairs for comparison.

There were significantly more placements ( $\chi^2=16.40$ ,  $P<.001$ ), changes of guardian ( $\chi^2=10.00$ ,  $P<.01$ ), and patients with neglect ( $\chi^2=4.00$ ,  $P<.05$ ) in the exposed group than in the nonexposed group. Four exposed patients were definitely abused compared to 1 nonexposed patient ( $\chi^2=3.00$ ,  $P>.05$ ,  $RR=4.00$ ) and 14 exposed patients had "maltreatment" compared to 6 nonexposed patients ( $\chi^2=3.56$ ,  $P>.05$ ), but neither of these differences were significant. The injuries incurred by these two subgroups were similar to those incurred by the groups as a whole, but the differences between the groups were less striking.

To control for the effect that a significant difference in the proportions of premature infants between exposed and nonexposed groups might have had on outcome events, a comparison of the two groups was made in which all pairs where the exposed infant was less than 37 weeks and the nonexposed infant was not were eliminated. These results are shown in Tables 19 and 20, and are very similar to those in the previous comparison. There were again significant differences in placements ( $\chi^2=8.04$ ,  $P<.01$ ), changes of guardian ( $\chi^2=9.00$ ,  $P<.01$ ), and neglect ( $\chi^2=4.57$ ,  $P<.05$ ), and noticeable but not significant differences in definite abuse ( $\chi^2=3.00$ ,  $P>.05$ ,  $RR=4.00$ ) and "maltreatment" ( $\chi^2=3.55$ ,  $P>.05$ ,  $RR=2.33$ ). The differences in injuries were somewhat more striking than in the previous comparison.

Finally, to control for the large difference in the numbers of exposed and nonexposed patients with moderate neonatal complications, all pairs in which the exposed patient had a moderate neonatal complication and the



nonexposed patient did not were eliminated. The resulting comparisons are shown in Tables 21 and 22. There were significant differences in definite abuse ( $\chi^2=4.00$ ,  $P<.05$ ), neglect ( $\chi^2=6.25$ ,  $P<.05$ ), "maltreatment" ( $\chi^2=7.35$ ,  $P<.01$ ), placements ( $\chi^2=14.26$ ,  $P<.001$ ), and changes of guardian ( $\chi^2=12.00$ ,  $P<.001$ ). Again, the differences in the types of injuries between the two groups were very apparent.



## DISCUSSION

The results of this study indicate that the DART program is indeed identifying those infants who are at high risk for the later occurrence of child abuse or neglect. Forty eight percent of the high risk infants in this study suffered at least one episode of physical or sexual abuse, neglect, placement, or change of guardian. Only eleven percent of comparison infants suffered one of these outcomes.

The false-positive rate of 52% and the false-negative rate of 11% found in this study compare favorably with the results of other studies in the literature. Gray et al (1977) had a false-positive rate of 56% and a false-negative rate of 8%, Lealman et al (1983) reported rates of 96.5% and 0.4%, Altemeier et al (1979) reported rates of 89% and 2.3%, and Hunter et al (1978) reported rates of 76% and 0%. As discussed earlier, these studies compared slightly different outcomes, and had shorter durations of follow-up than the present study. The Hunter study involved only infants admitted to a neonatal intensive care unit.

This study has shown that high risk infants were significantly more likely to suffer an episode of definite abuse than were infants not thought to be at high risk. Infants from the former group were also significantly more likely to suffer neglect than were infants from the latter group. In addition, the injuries suffered by high risk patients in the first several years of life were more serious, more often permanent, and more likely to result in hospitalization than the injuries suffered by similar infants not considered at high risk. While high risk infants suffered a death, a skin graft, a duodenal hematoma, and three episodes of neurologic damage, no comparison infant was hospitalized for a



non-accidental injury.

Only three episodes of sexual abuse were reported in study patients during the time period of this study. This is not enough occurrences to make any type of comparison. It is interesting to note that of the three incidents, the perpetrator was the father in one and was known to the family in another.

The differences in the occurrence of placements and changes of guardian between the two groups was significant, and this study therefore indicates that high risk infants were more likely to be placed in a foster or relative home and to suffer a change of guardian than were similar infants not considered at high risk. These outcomes occurred for a variety of reasons as shown in Table 13. These different reasons are yet another indicator that high risk infants did suffer a large number of poor outcomes as a result of different types of parenting failure. The 7 permanent placements and 3 additional placements of longer than one year are further indication that these infants suffered significant disruptions in their early childhood as a result of their parents' problems.

The goal of this study to follow patients at least through the first three years of life was met for most patients. High risk patients were followed until a mean age of 38.4 months and comparison patients until a mean age of 40.1 months. In addition, 56 patients in the first group and 58 in the latter group were followed throughout the duration of the study. These results indicate that differences between the two groups in well child care or other outcomes can not be attributed to a difference in the length of time that they were followed.

There were few significant differences between the two groups in the well child care and development variables studied. This appears to be due to the fact that both groups are representative of a hospital clinic



population that in general does poorly in these areas. Both groups had very high proportions of patients with problems in attendance at clinic visits. Each group had 10% with weight below or equal to the fifth percentile, which is of course twice the expected result. Developmental delay was also unusually common in both groups, although more so in the exposed group.

There were differences in the numbers of patients with non-organic failure-to-thrive and inappropriate ER visits between the two groups, although neither was significant. Non-organic failure-to-thrive is now widely accepted as part of the child maltreatment syndrome (Fontana, 1984), and one would have expected the high risk infants to have had more such outcomes than the comparison group. The fact that this difference was not significant might have been due to the small size of the study group. Inappropriate visits to the ER with a healthy child are thought to represent a call for help from an overwhelmed parent (Kempe, 1978a), and the difference between the two groups here is noteworthy.

It is interesting that the difference between the two groups in late or missed immunizations was not significant for the MMR but was significant for the fourth DPT. It is not clear why this occurred, but the reason might have been that mothers became less concerned about their child's health care after 15-20 months of age. Immunizations are often used as an indicator of general and preventive health care (Fontana, 1984), and a lack of interest in these areas among high risk mothers is cause for concern. Equally disconcerting is the difference between the two groups in the frequency with which poor mother-child interaction was noted. A poor interaction between mother and child probably predisposes the child to other bad outcomes in the future.

Although there were more episodes of abuse and neglect among high risk



patients, there were many more episodes of accidental injury among the comparison group. This brings up the concern that similar events might have been considered abuse or neglect in high risk patients and accidents in comparison patients. The fact that the blinded reviewer was unaware of the patient's risk status makes this less likely. In addition, a look at the types of injuries that occurred in the two groups reveals that many more lacerations, abrasions, and minor soft tissue injuries occurred among the comparison patients. This indicates that events were not similar in the two groups, and that accidents were in fact more frequent among comparison patients. The reason for this occurrence is not clear.

The reasons that patients in this study were referred to the DART Committee were representative of many of the risk factors described in the literature and were similar to many of the subjective indicators used by Gray et al (1977). Previous problems with an older sibling are a major risk factor, and were well represented in our study group. Obviously these numbers indicate only those families in which such problems were recognized by authorities, and problems may have gone unrecognized in other families. This demonstrates the importance of detection and reporting of these occurrences when they do exist so that the patient and his or her siblings can be protected.

Psychiatric, drug, and alcohol problems in the mother, as well as diminished intelligence, were also major reasons for referral in our study population. A history of abuse or neglect of the mother as a child was also noted in several instances. Unlike the other reasons mentioned, however, this is often not known by the clinician and would not be expected to be used commonly as a reason for referral.

Sixty four, or 81%, of the exposed patients had one of the above reasons as their most serious reason for referral. The other 20 reasons



were usually listed as additional reasons for referral, but did account for the most serious reason for referral in 15 patients. Many of these involved problems with the baby's father or with the extended family of the baby's mother, all of whom were less directly involved with the care of the infant, but were a factor in its environment.

It is encouraging to see that although young mother and poor prenatal care/delivery at home were both used often as a reason for referral, each was used only once as the most serious reason. The increasing number of teenage mothers, many of whom undoubtedly receive poor prenatal care, makes it necessary to be more discriminating in deciding which are truly at risk for maltreating their children. These results indicate that such discrimination is occurring.

As noted earlier, attempts were made to identify individual reasons for referral which carried an even greater risk of poor outcome than did the high risk group as a whole. This would allow even more specific identification to be made of infants at highest risk for poor outcomes, and would help to more effectively target funds and efforts at intervention. Unfortunately, no single reason or group of reasons could be found which were associated with a worse outcome than the group as a whole. This might have been due to the relatively small numbers in each group, as a difference of one or two patients could have made the difference in statistical significance with these numbers. This is an important area for future study.

The interventions offered to the high risk families in this study included many of the interventions discussed in the literature. It should be noted that all patients followed in the Yale-New Haven Hospital Primary Care Center have one pediatric resident who provides their care whenever possible. This is consistent with the recommendation of Gray et al (1977)



that continuity of care is an essential aspect of prevention. Because this study was intended to evaluate the outcome of infants identified at birth as being at high risk for child maltreatment, it was concerned primarily with those interventions offered during the neonatal period. Other interventions offered later in life usually were offered in response to a bad outcome event and not because the child was at high risk.

The most significant intervention is undoubtedly removal of the child from the home either temporarily or permanently. Four study infants were placed from the hospital into a home other than their own for some length of time. Eight families received the services of a parent-aide during the post-partum period. Parent-aides were discussed previously, and their function is very much like that of the lay health visitors described by Kempe and his colleagues (Kempe, 1976; Gray, 1980). A family advocate is a stable, mature adult who visits the home to provide a stable environment and to help the family deal with stressful situations. Three study families received this service during the post-partum period. These are thought to be the major interventions offered to parents in this study. Home-makers and visiting nurses also provide a stable figure in the household, but they do so for shorter periods of time and with different goals. Psychiatric, narcotic, and mental retardation programs rarely have lasting effects, and positive results occur only after long periods of time. Social Service and DCYS referral often result in little more than observing the family and intervening when problems arise.

There is no established program at Yale-New Haven Hospital to use a particular intervention in certain high risk families, such as the programs described by Gray and Kaplan (1980), Armstrong (1981), and Gabinet (1979b). Moreover, there is no established process for deciding which families will be offered which interventions, and for how long. Lack



of funding has prevented the development of either type of program.

Interventions are offered to families with a certain amount of inconsistency, because decisions are made by the individual social worker and DCYS worker assigned to each case.

In an effort to determine whether interventions offered to high risk families had any effect on future outcome, patients who received one of the major interventions described above were compared to patients who did not. Again, the small number of patients in the study was a problem, because only 14 patients received one of these major interventions. It is difficult to show statistical significance when comparing outcomes in a group of 14 patients with outcomes in a group of 65 patients.

Patients in the two groups were followed for a relatively similar length of time, so differences in outcome between the two groups can not be attributed to different lengths of observation. The only significantly different outcome between the two groups was in the number of patients suffering episodes of neglect/accident. This difference is difficult to interpret. However, all 5 high risk infants with definite abuse were in the group without major intervention and this group also had a larger proportion of patients with "maltreatment," but neither difference was statistically significant. The group without major intervention also had more serious types of injury, but no conclusion can be drawn from this data. Thus, although it appears that the high risk patients who did receive one of the major interventions had slightly better outcomes than those who did not, no definite conclusion can be made from the data available.

There were differences between the high risk and comparison groups in several non-matched baseline variables. Although the mean maternal age of the two groups and the proportion of the two groups with maternal age less



than 20 were similar, there was a significant difference in the proportions with maternal age less than 18 years. This may have been due to the tendency of clinicians to consider young maternal age a risk factor for poor outcome, even though most of these families also had a more serious reason for DART referral. Because many studies have found young mothers to be more likely to maltreat their children, it could be argued that some or all of the differences in outcomes between these two groups was due to the larger proportion of mothers under 18 in the high risk group, rather than to the real reasons for which these children were thought to be at risk.

When exposed-nonexposed pairs in which the exposed mother was under 18 and the nonexposed mother was not were eliminated, a comparison of outcomes between the two groups revealed significant differences in placements, changes of guardian, and neglect. Differences in definite abuse and "maltreatment" were noticeable but not statistically significant, and the high risk patients did have more serious injuries. There is again a problem of not enough patients to show statistical significance, but it seems clear that high risk infants did worse than their matched comparisons, even when differences in maternal age were controlled for.

There was also a significant difference in the number of premature infants in the two groups. This difference might have been due to the fact that premature infants spent more time in the special care nursery, and their families were therefore subject to closer scrutiny than were the families of infants who spent only a few days in the hospital. Because prematurity has also been associated with increased risk for child maltreatment, this difference must be controlled for. The results of this comparison were very similar to the comparison controlling for maternal



age. Again the conclusion can be made that high risk infants did worse than their matched comparisons, even when differences in prematurity were controlled for.

Although there was no real difference in the number of patients from each group with major neonatal complications, there was a large difference in the number of patients with moderate complications. Moderate complications included narcotic withdrawal, apnea or bradycardia requiring Narcan therapy, surgical closure of an omphalocele, oxygen therapy by hood for one day, and premature atrial contractions. Only narcotic withdrawal occurred in more than one patient, so this can be assumed to have been responsible for most of the difference between the two groups. It is understandable that such a difference would have occurred, because maternal drug abuse was a common reason for DART referral. Controlling for this difference between the two groups still resulted in significant differences in definite abuse, neglect, "maltreatment", placements, and changes of guardian between the two groups, as well as a noticeable difference in the seriousness of injuries.

There was also a difference in the time spent in the special care nursery between the two groups, both in the mean number of days spent in the nursery and in the number of patients who spent more than five days there. It is likely that this difference was a result of both the increased number of premature infants in the high risk group and the increased number of patients with moderate neonatal complications in this group. It can be assumed that since neither of these differences appeared to be responsible for the difference in outcomes between the two groups, the difference in time spent in the special nursery was also not responsible for the difference in outcomes. Thus the many differences in outcome between high risk and comparison patients discussed previously



were not attributable to differences in baseline characteristics between them, but were in fact due to the reasons for which they were referred to the DART Committee.

This study was an observational cohort study in which the subjects were followed retrospectively by reviewing their medical records. A retrospective review does have disadvantages when compared to a prospective study. The patients are not available for study, and the reviewer must rely on the observations and impressions of others for study data. Moreover, the reviewer has available only what was recorded in the medical record at the time, and does not have the benefit of either speaking with the clinician who saw the patient or with the patient directly. As a result, information is occasionally incomplete, and interpretations may not be entirely accurate.

The advantages of a retrospective review are that it allows patients to be followed over several years in a short amount of time and at low cost. The patients in this study were followed chronologically by reviewing their medical records from birth until the time of the study, when most study children were either four or five years of age. This is considerably more follow-up than the other studies of high risk prediction that have appeared in the literature.

Leventhal (1982) reviewed the different types of study design used in studies of child abuse, and described the methodologic standards for each type which are most important to help minimize bias. For observational cohort studies, the three important methodologic standards are the choice of a specific control group, equalizing demographic and clinical susceptibilities, and minimizing detection bias. In this study, the first standard was met by the use of a control group specifically chosen for the study. The second standard was met by matching each individual exposed



patient with a nonexposed patient of the same sex, race, method of payment and time of birth. Method of payment was used as an indicator of socioeconomic status. Matching insures that any difference in outcomes between the two groups can not be attributed to differences in any of these four variables. The third standard was met by requiring that exposed and nonexposed subjects be followed at the same or similar health care facilities. This requirement helps to insure that similar outcomes in the two groups were observed, interpreted, and recorded similarly.

A major limitation of this study was the relatively small number of patients studied. The outcomes in this study were relatively rare, and larger numbers might have yielded more significant results for several of the comparisons. Because studies have shown that most episodes of child abuse and neglect occur in the first three years of life (Kempe, 1962), it was important to follow each patient for at least three years. Because the hospital's birth logs were not computerized until March 1979, it would have been difficult to find adequately matched comparison patients for high risk patients born much before this time. For these reasons it was decided to study patients born in the years 1979 and 1980. One hundred seventeen patients met this criterion, and it was not expected that 38 would be ineligible for the study. The major surprise was that 21, or 18%, were not followed in our well child care system. Additionally, it was not initially realized that 11 patients were either rejected or put on hold by the DART Committee. Patients born in 1981 are now being studied, and their data will hopefully add to the data presented here to answer important questions about the effectiveness of interventions and about the relative importance of different reasons for DART referral.

The goals of this study were to examine the reasons why newborn infants are referred to the DART Committee for presumed high risk for



child maltreatment, to investigate the ability of this system to predict which infants will in fact suffer maltreatment, and to determine the effectiveness of various interventions in preventing this outcome. It has been shown that infants are referred to the committee for reasons that are representative of those factors commonly discussed in the literature. It has also been shown that infants labelled at birth as being at high risk for child maltreatment had significantly more bad outcomes than did a matched group of comparison infants, and that this difference remained even when several baseline characteristics that differed between the two groups were controlled for. The interventions offered to the high risk infants were reviewed, and it appeared that those infants whose families received one of the major preventive interventions did somewhat better than those infants whose families did not, although these differences were far from significant. More data are needed to determine whether this difference is indeed real.

This study has demonstrated that the DART system as it now functions is able to successfully identify infants that are at high risk for maltreatment. The system is based on a more subjective and less structured clinical evaluation of an infant's family than other programs discussed in the literature, and is therefore more efficient and more widely applicable. It has also shown greater success with longer follow-up than most other programs studied.

It is hoped that the findings of this study will be an incentive to the development and institution of more effective preventive interventions that can be offered to high risk families. It is also hoped that additional data will become available in the future that will facilitate the determination of certain reasons for DART referral that are associated with a particularly bad outcome, so that even more specific targeting of preventive efforts will be possible.



## TABLES

Table 1. Reasons for DART Referral

Sibling abused

Sibling neglected

Sibling voluntarily placed in foster care

Mother mentally retarded or with "borderline intelligence"

Mother with psychiatric problems

Mother with drug history

Mother with alcohol history

Mother abused or neglected as a child

Infant placed in foster care at birth as "preventive placement"

Pregnancy unwanted, abortion or adoption considered, or mother  
"ambivalent" about pregnancy

Conflict or violence in the family

Mother involved with DCYS as a child because of criminal record or being  
ward of state

Poor prenatal care or delivery at home

Young mother

Father abused or neglected siblings but is no longer involved with mother

Father with alcohol or drug problem, bad temper, or jail or psychiatric  
history

Poor social support system for mother

Overcrowded living situation

Mother attempted to take newborn home from hospital early against medical  
advice

(continued)



Table 1. (continued)

Maternal grandmother with alcohol problem

Unsettled living situation or chaotic life

Mother had poor visiting record during infant's prolonged newborn hospitalization

Mother left hospital after delivery without infant against medical advice

Poor provisions at home for baby

DCYS or DART Committee already involved with other members of extended family

Mother was raised in a cruel foster home

Mother with history of truancy from school

Mother disappointed over sex of baby



Table 2. Categories of Neonatal Complications

Minor

Anemia requiring transfusion  
Hyperbilirubinemia requiring phototherapy  
Fractured clavicle  
Resuscitation with Ambu bag  
Erb's Palsy

Moderate

Narcotic withdrawal requiring phenobarbital therapy  
Bradycardia requiring Narcan therapy  
Apnea requiring Narcan therapy  
Surgical closure of omphalocele  
Requiring oxygen by hood for one day  
Premature atrial contractions for five days

Major

Meningitis  
Respiratory problems requiring ventilator  
Intraventricular hemorrhage  
Necrotizing enterocolitis  
Perinatal asphyxia

None

Prematurity  
Small for gestational age  
Fetal alcohol syndrome  
Ventricular septal defect not requiring surgery  
Poor feeding



Table 3. Categories of Severity of Medical/Surgical Hospitalization

Minor

Herniorrhaphy  
Tonsillectomy  
Eye surgery  
Hemangioma resection  
Tympanostomy tube insertion  
Abscess drainage  
Allergic reaction to insect bite

Moderate

Group  
Bronchiolitis  
Fever of Unknown Origin  
Asthma  
Pneumonia  
Febrile seizures  
Rule Out Sepsis  
Diarrhea/Dehydration  
Urinary Tract Infection  
Viral meningitis  
Spasmus nutans

Major

Bacteremia  
Bacterial meningitis  
Congenital sub-glottic web  
Seizure disorder  
Status asthmaticus  
Croup with respiratory distress  
Encephalopathy resulting from viral meningitis



Table 4. Matching Variables

|                          | <u>Exposed</u> | <u>Nonexposed</u> |
|--------------------------|----------------|-------------------|
| <b>Year of Birth</b>     |                |                   |
| 1980                     | 37 (47%)       | 38 (48%)          |
| 1979                     | 42 (53%)       | 41 (52%)          |
| <b>Sex</b>               |                |                   |
| Male                     | 42 (53%)       | 42 (53%)          |
| Female                   | 37 (47%)       | 37 (47%)          |
| <b>Race</b>              |                |                   |
| Black                    | 51 (65%)       | 51 (65%)          |
| White                    | 21 (27%)       | 21 (27%)          |
| Hispanic                 | 7 ( 8%)        | 7 ( 8%)           |
| <b>Method of Payment</b> |                |                   |
| Title 19                 | 72 (91%)       | 75 (95%)          |
| Self                     | 4 ( 5%)        | 4 ( 5%)           |
| Unknown                  | 3 ( 4%)        | 0 ( 0%)           |



Table 5. Nonmatched Baseline Variables

|                                  | <u>Exposed</u> | <u>Nonexposed</u> | <u>P</u> | <u>RR*</u> |
|----------------------------------|----------------|-------------------|----------|------------|
| <b>Maternal Age</b>              |                |                   |          |            |
| Mean                             | 22.0           | 22.3              | >.05     |            |
| # <20 years                      | 31 (40%)       | 29 (37%)          | >.05     | 1.07       |
| # <18 years                      | 18 (23%)       | 8 (10%)           | <.05     | 2.25       |
| <b>Birth Weight</b>              |                |                   |          |            |
| Mean                             | 2982.7         | 3137.7            | >.05     |            |
| # <2500 grams                    | 15 (19%)       | 10 (13%)          | >.05     | 1.50       |
| <b>Birth Length</b>              |                |                   |          |            |
| Mean                             | 48.7           | 49.4              | >.05     |            |
| <b>Cesarean Section</b>          |                |                   |          |            |
|                                  | 12 (15%)       | 9 (11%)           | >.05     | 1.33       |
| <b>&lt; 37 Weeks Gestation</b>   |                |                   |          |            |
|                                  | 16 (20%)       | 5 ( 6%)           | <.05     | 3.20       |
| <b>Apgar 1 &lt; 7</b>            |                |                   |          |            |
|                                  | 13 (16%)       | 11 (14%)          | >.05     | 1.18       |
| <b>Apgar 5 &lt; 7</b>            |                |                   |          |            |
|                                  | 5 ( 6%)        | 4 ( 5%)           | >.05     | 1.20       |
| <b>Days in NBSCU</b>             |                |                   |          |            |
| Mean                             | 7.5            | 2.3               | <.05     |            |
| # > 5                            | 25 (32%)       | 6 ( 8%)           | <.001    | 4.17       |
| <b>Neonatal Complications</b>    |                |                   |          |            |
| <b>Major</b>                     | 5 ( 6%)        | 4 ( 5%)           | >.05     | 1.20       |
| <b>Moderate &amp; Major</b>      | 20 (25%)       | 6 ( 8%)           | <.01     | 3.33       |
| <b>Med/Surg Hospitalizations</b> |                |                   |          |            |
| <b>Major</b>                     | 9 (11%)        | 1 ( 1%)           | <.05     | 9.00       |
| <b>Moderate</b>                  | 18 (23%)       | 7 ( 9%)           | <.05     | 2.57       |

\*Relative Risk



Table 6. Number of Patients with Each Reason for DART Referral

| <u>Reason</u>                                | <u>Most Serious Reason</u> | <u>Any Reason</u> |
|--|----------------------------|-------------------|
| Sibling Abused                               | 3 ( 4%)                    | 3 ( 4%)           |
| Sib Neglected/FTT/Poor WCC                   | 22 (28%)                   | 24 (30%)          |
| Sib Voluntarily Placed                       | 5 ( 6%)                    | 7 ( 9%)           |
| Mother MR/Borderline Intelligence            | 6 ( 8%)                    | 7 ( 9%)           |
| Mother Psych Problems                        | 17 (22%)                   | 22 (28%)          |
| Mother Drug History                          | 7 ( 9%)                    | 15 (19%)          |
| Mother Alcohol History                       | 3 ( 4%)                    | 6 ( 8%)           |
| Mother Abused/Neglected as Child             | 1 ( 1%)                    | 6 ( 8%)           |
| Preventive Placement at Birth                | 0 ( 0%)                    | 1 ( 1%)           |
| Preg Unwanted/Abortion/Adoption/Ambivalent   | 3 ( 4%)                    | 7 ( 9%)           |
| Conflict/Violence in Family                  | 5 ( 6%)                    | 11 (14%)          |
| Mother DCYS Because Ward of State/Criminal   | 2 ( 3%)                    | 4 ( 5%)           |
| Poor Prenatal Care/Delivery at Home          | 1 ( 1%)                    | 11 (14%)          |
| Young Mother                                 | 1 ( 1%)                    | 11 (14%)          |
| Father Abused/Neglected Sibs-Now in Jail     | 0 ( 0%)                    | 2 ( 3%)           |
| Father Alcohol/Drugs/Jail/Psych/Temper       | 0 ( 0%)                    | 3 ( 4%)           |
| Poor Social Support                          | 1 ( 1%)                    | 5 ( 6%)           |
| Overcrowded Living Situation                 | 1 ( 1%)                    | 2 ( 3%)           |
| Attempt to Take Baby Home AMA                | 0 ( 0%)                    | 1 ( 1%)           |
| MGM Alcoholic                                | 0 ( 0%)                    | 1 ( 1%)           |
| Unsettled Living Situation/Chaotic Life      | 0 ( 0%)                    | 4 ( 5%)           |
| Poor Visiting During Newborn Hospitalization | 0 ( 0%)                    | 2 ( 2%)           |
| Mother Leaving AMA without Baby              | 1 ( 1%)                    | 1 ( 1%)           |
| Poor Provisions for Baby                     | 0 ( 0%)                    | 1 ( 1%)           |
| DCYS/DART Involved with Extended Family      | 0 ( 0%)                    | 1 ( 1%)           |
| Mother Raised in Cruel Foster Home           | 0 ( 0%)                    | 1 ( 1%)           |
| Mother Truant                                | 0 ( 0%)                    | 1 ( 1%)           |
| Disappointed over Baby's Sex                 | 0 ( 0%)                    | 1 ( 1%)           |



Table 7. Post-Partum Interventions for Exposed Patients

| <u>Intervention</u>                | <u>Number of Patients</u> |
|------------------------------------|---------------------------|
| Social Services Referral           | 79 (100%)                 |
| DCYS Involvement                   | 60 ( 76%)                 |
| (4 others refused by DCYS)         |                           |
| Preventive Placement-Voluntary     | 3 ( 4%)                   |
| Preventive Placement-Court Ordered | 1 ( 1%)                   |
| Parent-Aide                        | 8 ( 10%)                  |
| Family Advocate                    | 3 ( 4%)                   |
| Home-Maker                         | 1 ( 1%)                   |
| Visiting Nurse                     | 37 ( 47%)                 |
| (6 additional mothers refused)     |                           |
| Psychiatric Evaluation/Treatment   | 15 ( 19%)                 |
| Preventive Services                | 9 ( 11%)                  |
| Methadone Program                  | 2 ( 3%)                   |
| Mental Retardation Program         | 1 ( 1%)                   |
| Battered Women's Group             | 1 ( 1%)                   |
| (1 mother refused referral)        |                           |
| Catholic Family Services           | 1 ( 1%)                   |



Table 8. Sources of Well Child Care

|                                | <u>Exposed</u> | <u>Nonexposed</u> |
|--------------------------------|----------------|-------------------|
| PCC/HSR/HHC/FHCHC* only        | 56             | 58                |
| System to local pediatrician   | 12             | 12                |
| Local pediatrician to system   | 2              | 0                 |
| System to distant pediatrician | 5              | 4                 |
| In and out of system           | 2              | 5                 |
| Died before WCC                | 1              | 0                 |
| Incomplete information         | 1              | 0                 |

\*PCC= Yale-New Haven Hospital Primary Care Center

HSR= Hospital of Saint Raphael

HHC= Hill Health Center

FHCHC= Fair Haven Community Health Clinic



Table 9. Well Child Care and Development Data

|                                | <u>Exposed</u> | <u>Nonexposed</u> | <u><math>\chi^2</math></u> | <u>P</u> | <u>RR</u> |
|--------------------------------|----------------|-------------------|----------------------------|----------|-----------|
| Attendance Problems            | 32 (41%)       | 27 (34%)          | 0.58                       | >.05     | 1.19      |
| <b>Immunizations</b>           |                |                   |                            |          |           |
| MMR >20 mos. or no record      | 15 (19%)       | 10 (13%)          | 1.47                       | >.05     | 1.50      |
| DPT #4 >24 mos. or no record   | 29 (37%)       | 12 (15%)          | 9.97                       | <.01     | 2.42      |
| <b>Weight</b>                  |                |                   |                            |          |           |
| <u>≤5%</u> at least once       | 8 (10%)        | 8 (10%)           | 0.00                       | 1.00     | 1.00      |
| FTT hospitalizations           | 1 ( 1%)        | 1 ( 1%)           | 0.00                       | 1.00     | 1.00      |
| Non-organic FTT                | 6 ( 8%)        | 1 ( 1%)           | 3.57                       | >.05     | 6.00      |
| <b>Developmental Delay</b>     |                |                   |                            |          |           |
| Major                          | 4 ( 5%)        | 1 ( 1%)           | 1.80                       | >.05     | 4.00      |
| Major & Moderate               | 5 ( 6%)        | 2 ( 3%)           | 1.28                       | >.05     | 2.50      |
| Major, Moderate & Minor        | 8 (10%)        | 5 ( 6%)           | 0.69                       | >.05     | 1.60      |
| Poor Infant Hygiene            | 2 ( 3%)        | 1 ( 1%)           | 0.33                       | >.05     | 2.00      |
| Poor Mother-Infant Interaction | 4 ( 5%)        | 0 ( 0%)           | 4.00                       | <.05     | *         |
| Inappropriate ER Visit         | 3 ( 4%)        | 0 ( 0%)           | 3.00                       | >.05     | *         |

\* can not be calculated



Table 10. Total Episodes of Injury Events by Cause

|                             | <u>Blinded Reviewer</u> |                   | <u>Chart Reviewer</u> |                   |
|-----------------------------|-------------------------|-------------------|-----------------------|-------------------|
|                             | <u>Exposed</u>          | <u>Nonexposed</u> | <u>Exposed</u>        | <u>Nonexposed</u> |
| Definite Abuse              | 7                       | 1                 | 7                     | 0                 |
| Probable Abuse              | 2                       | 0                 | 3                     | 0                 |
| Question Abuse              | 0                       | 0                 | 2                     | 1                 |
| Abuse/Neglect               | 0                       | 0                 | 3                     | 0                 |
| Neglect                     | 15                      | 5                 | 14                    | 2                 |
| Neglect/Accident            | 19                      | 14                | 20                    | 18                |
| Accident                    | 58                      | 73                | 55                    | 71                |
| Accident/Household Violence | 1                       | 1                 | 1                     | 1                 |
| Medical Neglect             | 5                       | 5                 | 5                     | 5                 |
| Unknown                     | <u>5</u>                | <u>1</u>          | <u>2</u>              | <u>2</u>          |
| TOTAL                       | 112                     | 100               | 112                   | 100               |



Table 11. Number of Patients with each Injury Cause

|                         | <u>Exposed</u> | <u>Nonexposed</u> | <u><math>\chi^2</math></u> | <u>P</u> | <u>RR</u> |
|-------------------------|----------------|-------------------|----------------------------|----------|-----------|
| Definite Abuse          | 5 ( 6%)        | 1 ( 1%)           | 4.00                       | <.05     | 5.00      |
| Probable Abuse          | 2 ( 3%)        | 0 ( 0%)           | 2.00                       | >.05     | *         |
| Question Abuse          | 0 ( 0%)        | 0 ( 0%)           | *                          | *        | *         |
| Abuse/Neglect           | 0 ( 0%)        | 0 ( 0%)           | *                          | *        | *         |
| Neglect                 | 13 (16%)       | 4 ( 5%)           | 4.76                       | <.05     | 3.25      |
| Neglect/Accident        | 16 (20%)       | 12 (15%)          | 0.80                       | >.05     | 1.33      |
| Medical Neglect         | 4 ( 5%)        | 3 ( 4%)           | 0.14                       | >.05     | 1.33      |
| Accident                | 35 (44%)       | 36 (46%)          | 0.03                       | >.05     | 0.97      |
| Accident/Household Viol | 1 ( 1%)        | 1 ( 1%)           | 0.00                       | 1.00     | 1.00      |
| Maltreatment **         | 19 (24%)       | 7 ( 9%)           | 6.00                       | <.05     | 2.71      |

\* can not be calculated

\*\* indicates patients with at least one episode of definite abuse, probable abuse, question abuse, abuse/neglect, neglect, or medical neglect



Table 12. Types of Injury

|  | <u>Exposed</u> | <u>Nonexposed</u> |
|--|----------------|-------------------|
| Death                                    | 1              | 0                 |
| Head injury with neurologic damage       | 3              | 0                 |
| Subdural hematoma                        | 0              | 0                 |
| Skull fracture                           | 0              | 0                 |
| Multiple fractures                       | 0              | 0                 |
| Fracture                                 | 2              | 2                 |
| Head bump or concussion                  | 17             | 14                |
| Head/Face laceration or abrasion         | 19             | 25                |
| Other laceration or abrasion             | 12             | 17                |
| Minor soft tissue injury                 | 3              | 5                 |
| Burn                                     | 15             | 7                 |
| Major burn                               | 1              | 0                 |
| Ingestion                                | 7              | 7                 |
| Duodenal hematoma                        | 1              | 0                 |
| Dislocation                              | 2              | 3                 |
| Dog bite                                 | 2              | 1                 |
| Human bite                               | 0              | 2                 |
| Penny swallowed                          | 0              | 1                 |
| Lead poisoning                           | 3              | 2                 |
| Fall from bed                            | 8              | 2                 |
| MVA                                      | 3              | 5                 |
| Kidnapped                                | 0              | 1                 |
| Long term abuse without specified injury | 2              | 0                 |
| No injury                                | 11             | 5                 |



Table 13. Reasons for Placement

|   | <u>Exposed</u> | <u>Nonexposed</u> |
|---|----------------|-------------------|
| Voluntary Preventive Placement            | 3              | 0                 |
| Court Ordered Preventive Placement        | 1              | 0                 |
| Abuse/Question Abuse                      | 4              | 0                 |
| Neglect/FTT/Medical Neglect               | 7              | 3                 |
| Abandonment                               | 2              | 1                 |
| Mom unwilling/unable to care for infant   | 1              | 0                 |
| Family Conflict/Violence                  | 3              | 0                 |
| Housing Crisis                            | 1              | 0                 |
| Mother alcoholic                          | 1              | 0                 |
| Mother and infant in foster home together | 1              | 0                 |
| No information                            | 4              | 0                 |

Table 14. Duration of Placement

|                              | <u>Exposed</u> | <u>Nonexposed</u> |
|------------------------------|----------------|-------------------|
| < 1 month                    | 0              | 0                 |
| 1 - < 3 months               | 4              | 0                 |
| 3 - < 6 months               | 5              | 2                 |
| 6 - < 12 months              | 1              | 0                 |
| 1 - < 2 years                | 2              | 0                 |
| ≥ 2 years, but not permanent | 1              | 0                 |
| permanent                    | 7              | 0                 |
| unknown/unclear              | 8              | 2                 |



**Table 15. Outcomes in Patients With and Without Major Intervention**

|                             | <u>With (N=14)</u> | <u>Without (N=65)</u> | <u><math>\chi^2</math></u> | <u>P</u> |
|-----------------------------|--------------------|-----------------------|----------------------------|----------|
| Definite Abuse              | 0 ( 0%)            | 5 ( 8%)               | 1.14                       | >.05     |
| Probable Abuse              | 1 ( 7%)            | 1 ( 2%)               | 1.44                       | >.05     |
| Question Abuse              | 0 ( 0%)            | 0 ( 0%)               | *                          | *        |
| Abuse/Neglect               | 0 ( 0%)            | 0 ( 0%)               | *                          | *        |
| Neglect                     | 1 ( 7%)            | 12 (18%)              | 1.04                       | >.05     |
| Neglect/Accident            | 0 ( 0%)            | 16 (25%)              | 4.33                       | <.05     |
| Accident                    | 5 (36%)            | 30 (46%)              | 0.46                       | >.05     |
| Accident/Household Violence | 0 ( 0%)            | 1 ( 2%)               | 0.26                       | >.05     |
| Medical Neglect             | 1 ( 7%)            | 3 ( 5%)               | 0.18                       | >.05     |
| Maltreatment                | 3 (21%)            | 16 (25%)              | 0.05                       | >.05     |

\* can not be calculated



**Table 16. Types of Injury in Patients With and Without Major Intervention**

|                                  | <u>With (N=14)</u> | <u>Without (N=65)</u> |
|----------------------------------|--------------------|-----------------------|
| Death                            | 0 ( 0%)            | 1 ( 2%)               |
| Neurologic damage                | 0 ( 0%)            | 3 ( 5%)               |
| Fracture                         | 2 (14%)            | 0 ( 0%)               |
| Head bump or concussion          | 1 ( 7%)            | 16 (25%)              |
| Head/Face laceration or abrasion | 2 (14%)            | 17 (26%)              |
| Other laceration or abrasion     | 0 ( 0%)            | 12 (18%)              |
| Minor soft tissue injury         | 0 ( 0%)            | 3 ( 5%)               |
| Burn                             | 4 (29%)            | 11 (17%)              |
| Major burn                       | 0 ( 0%)            | 1 ( 2%)               |
| Ingestion                        | 0 ( 0%)            | 7 (11%)               |
| Duodenal Hematoma                | 0 ( 0%)            | 1 ( 2%)               |
| Lead poisoning                   | 0 ( 0%)            | 3 ( 5%)               |
| Other accidental injury          | 5 (36%)            | 10 (15%)              |
| Long term abuse                  | 0 ( 0%)            | 2 ( 3%)               |
| No injury                        | 1 ( 7%)            | 10 (15%)              |



Table 17. Outcome Events Corrected for Maternal Age < 18 (N=61)

|                    | <u>Exposed</u> | <u>Nonexposed</u> | <u>X<sup>2</sup></u> | <u>P</u> | <u>RR</u> |
|--------------------|----------------|-------------------|----------------------|----------|-----------|
| Definite Abuse     | 4 ( 7%)        | 1 ( 2%)           | 3.00                 | >.05     | 4.00      |
| Probable Abuse     | 2 ( 3%)        | 0 ( 0%)           | 2.00                 | >.05     | *         |
| Neglect            | 8 (13%)        | 4 ( 7%)           | 4.00                 | <.05     | 2.00      |
| Neglect/Accident   | 12 (20%)       | 10 (16%)          | 0.28                 | >.05     | 1.20      |
| Accident           | 24 (39%)       | 30 (49%)          | 1.38                 | >.05     | 0.80      |
| Medical Neglect    | 4 ( 7%)        | 2 ( 3%)           | 0.67                 | >.05     | 2.00      |
| Maltreatment       | 14 (23%)       | 6 (10%)           | 3.56                 | >.05     | 2.33      |
| Placement          | 22 (36%)       | 2 ( 3%)           | 16.40                | <.001    | 11.00     |
| Change of Guardian | 10 (16%)       | 0 ( 0%)           | 10.00                | <.01     | *         |

\* can not be calculated



Table 18. Types of Injury Corrected for Maternal Age < 18 (N=61)

|                                  | <u>Exposed</u> | <u>Nonexposed</u> |
|----------------------------------|----------------|-------------------|
| Death                            | 1              | 0                 |
| Neurologic damage                | 2              | 0                 |
| Fracture                         | 1              | 2                 |
| Head bump or concussion          | 13             | 13                |
| Head/Face laceration or abrasion | 11             | 19                |
| Other laceration or abrasion     | 6              | 13                |
| Minor soft tissue injury         | 3              | 3                 |
| Burn                             | 6              | 7                 |
| Major burn                       | 1              | 0                 |
| Ingestion                        | 7              | 5                 |
| Duodenal Hematoma                | 1              | 0                 |
| Lead poisoning                   | 3              | 0                 |
| Kidnapped                        | 0              | 1                 |
| Other accidental injury          | 11             | 12                |
| Long term abuse                  | 1              | 0                 |
| No injury                        | 10             | 3                 |



Table 19. Outcome Events Corrected for Prematurity (N=64)

|                    | <u>Exposed</u> | <u>Nonexposed</u> | <u><math>\chi^2</math></u> | <u>P</u> | <u>RR</u> |
|--------------------|----------------|-------------------|----------------------------|----------|-----------|
| Definite Abuse     | 4 ( 6%)        | 1 ( 2%)           | 3.00                       | >.05     | 4.00      |
| Probable Abuse     | 0 ( 0%)        | 0 ( 0%)           | *                          | *        | *         |
| Neglect            | 11 (17%)       | 3 ( 5%)           | 4.57                       | <.05     | 3.67      |
| Neglect/Accident   | 13 (20%)       | 10 (16%)          | 0.53                       | >.05     | 1.30      |
| Accident           | 28 (44%)       | 28 (44%)          | 0.00                       | 1.00     | 1.00      |
| Medical Neglect    | 2 ( 3%)        | 3 ( 5%)           | 0.20                       | >.05     | 0.67      |
| Maltreatment       | 14 (22%)       | 6 ( 9%)           | 3.55                       | >.05     | 2.33      |
| Placement          | 17 (27%)       | 4 ( 6%)           | 8.04                       | <.01     | 4.25      |
| Change of Guardian | 9 (14%)        | 0 ( 0%)           | 9.00                       | <.01     | *         |

\* can not be calculated



Table 20. Types of Injury Corrected for Prematurity (N=64)

|                                  | <u>Exposed</u> | <u>Nonexposed</u> |
|----------------------------------|----------------|-------------------|
| Death                            | 1              | 0                 |
| Neurologic damage                | 3              | 0                 |
| Fracture                         | 2              | 2                 |
| Head bump or concussion          | 13             | 12                |
| Head/Face laceration or abrasion | 17             | 22                |
| Other laceration or abrasion     | 11             | 14                |
| Minor soft tissue injury         | 2              | 3                 |
| Burn                             | 12             | 3                 |
| Major burn                       | 1              | 0                 |
| Ingestion                        | 4              | 7                 |
| Duodenal hematoma                | 1              | 0                 |
| Lead poisoning                   | 0              | 2                 |
| Kidnapped                        | 0              | 1                 |
| Other accidental injury          | 10             | 8                 |
| Long term abuse                  | 2              | 0                 |
| No injury                        | 7              | 5                 |



Table 21. Outcome Events Corrected for Moderate Neonatal Complications  
(N=64)

|                    | <u>Exposed</u> | <u>Nonexposed</u> | <u>X<sup>2</sup></u> | <u>P</u> | <u>RR</u> |
|--------------------|----------------|-------------------|----------------------|----------|-----------|
| Definite Abuse     | 5 ( 8%)        | 1 ( 2%)           | 4.00                 | <.05     | 5.00      |
| Probable Abuse     | 2 ( 3%)        | 0 ( 0%)           | 2.00                 | >.05     | *         |
| Neglect            | 13 (20%)       | 3 ( 5%)           | 6.25                 | <.05     | 4.33      |
| Neglect/Accident   | 15 (23%)       | 10 (16%)          | 1.47                 | >.05     | 1.50      |
| Accident           | 31 (48%)       | 31 (48%)          | 0.00                 | 1.00     | 1.00      |
| Medical Neglect    | 4 ( 6%)        | 3 ( 5%)           | 0.14                 | >.05     | 1.33      |
| Maltreatment       | 19 (30%)       | 6 ( 9%)           | 7.35                 | <.01     | 3.17      |
| Placement          | 24 (38%)       | 4 ( 6%)           | 14.26                | <.001    | 6.00      |
| Change of Guardian | 12 (19%)       | 0 ( 0%)           | 12.00                | <.001    | *         |

\* can not be calculated



Table 22. Types of Injury Corrected for Moderate Neonatal Complications

(N=64)

|                                  | <u>Exposed</u> | <u>Nonexposed</u> |
|----------------------------------|----------------|-------------------|
| Death                            | 1              | 0                 |
| Neurologic damage                | 3              | 0                 |
| Fracture                         | 1              | 2                 |
| Head bump or concussion          | 14             | 12                |
| Head/Face laceration or abrasion | 17             | 22                |
| Other laceration or abrasion     | 12             | 16                |
| Minor soft tissue injury         | 5              | 4                 |
| Burn                             | 14             | 5                 |
| Major burn                       | 1              | 0                 |
| Ingestion                        | 6              | 7                 |
| Duodenal hematoma                | 1              | 0                 |
| Lead poisoning                   | 2              | 2                 |
| Kidnapped                        | 0              | 1                 |
| Other accidental injury          | 14             | 10                |
| Long term abuse                  | 2              | 0                 |
| No injury                        | 11             | 5                 |



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